To: Bray, Dave[Bray.Dave@epa.gov]; Wilson, Wenona[Wilson.Wenona@epa.gov]
From: Ken Merrill
Sent: Tue 10/4/2016 11:21:53 PM
Subject: RE: Spokane Class 1 airshed redesignation submission document - Preliminary screening model for air impacts from Smelter near Kalispel Reservation
removed.txt
Pages from Spokane Tribe of Indians Redesignation Document - Main Document.pdf
Pages from Spokane Tribe of Indians Redesignation Document - Appendix Section.pdf

Dave and Wenona,
Here is the Spokane's Class 1 redesignation submission documents they so kindly sent us. I told them I would forward it on to you with their permission. --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Thursday, September 29, 2016 2:23 PM
To: Ken Merrill; Wilson, Wenona
Subject: RE: Preliminary screening model for air impacts from Smelter near Kalispel Reservation

Thanks Ken.

Interesting stuff.

If we do end up doing some screening modeling, our modeler will need to get some more detailed information from the company (or Ecology if they've got something from the company yet).

Look forward to talking more soon.

Dave

David C. Bray
Associate Director for Air
Office of Air and Waste
EPA Region 10
Seattle, WA
(206) 553-4253

From: Ken Merrill [mailto:kmerrill@knrd.org]
Sent: Wednesday, September 28, 2016 2:44 PM
To: Wilson, Wenona <Wilson.Wenona@epa.gov>
Cc: Bray, Dave <Bray.Dave@epa.gov>
Subject: RE: Preliminary screening model for air impacts from Smelter near Kalispel Reservation

FYI- Attached is some info on the smelter project sent to us by the project proponent. PM numbers are omitted for some reason --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Ken Merrill
Sent: Tuesday, September 27, 2016 4:46 PM
To: Wilson, Wenona
Cc: 'Bray, Dave'; Zach Welcker; Deane Osterman
Subject: Preliminary screening model for air impacts from Smelter near Kalispel Reservation

Hi Wenona,

Thank you for your time today, and as we discussed, the Tribe needs to understand how the proposed smelter might impact the home of the Kalispel people and understand how a redesignation of the Tribes airshed to Class 1 might affect the PSD permitting outcome and the Tribe's air quality. If there were a way that EPA could help to do some screening modeling, we think it would help the Kalispel develop the capacity to best protect our right to clean air on the reservation.

Thanks for the consideration --Ken

Kenneth R. Merrill
Manager - Water Resources Program
Kalispel Tribe Natural Resources
PO Box 39, Usk, WA, 99180
(509) 447-7276 (office)
Ex. 6 (cell)

APPENDIX

APPENDIX A

ATMOSPHERIC STABILITY

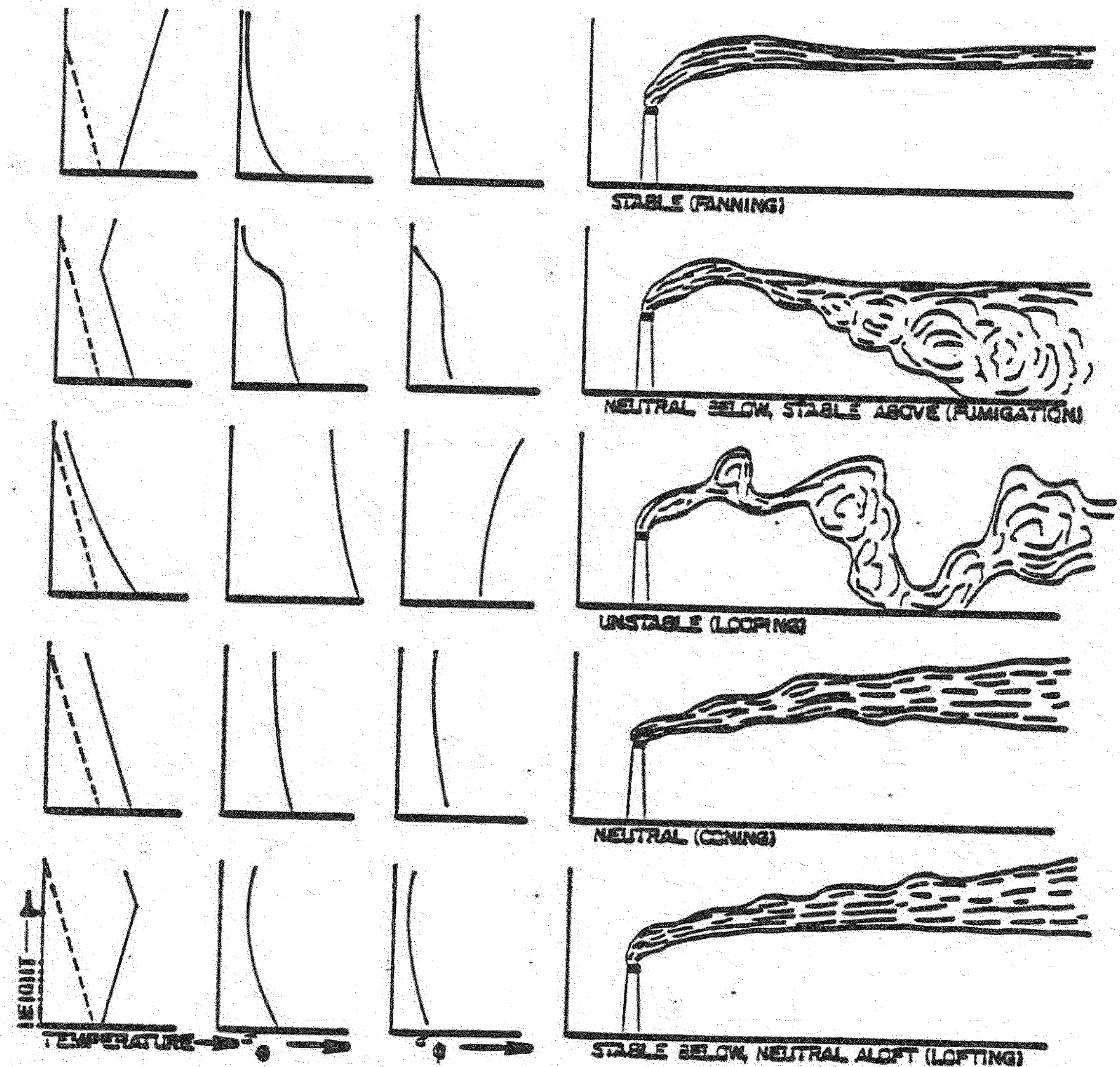

Figure D-1.

Various Types of Smoke-Plume Patterns Observed in the Atmosphere. The dashed curves in the left-hand column of diagrams show the adiabatic lapse rate, and the solid lines are the observed profiles. The abscissas of the columns for the horizontal and vertical wind direction standard deviations (and) represent a range of about 0° to 25°.

Source: Marlatt and Associates, 1978.

Atmospheric stability is a measure of the atmosphere's capability to horizontally and vertically disperse pollutants. A standard measure of stability has been the Pasquill stability classification. The Pasquill stability classes are defined as follows:

A - Extremely unstable
B - Moderately unstable
C - Slightly unstable
D - Neutral
E - Slightly stable
F - Moderately stable

This coding system defines each category as follows: (1) unstable conditions (Classes A, B, and C) occur when layers of air close to the ground undergo warming with associated low wind speeds, (2) stable conditions (Classes E and F) occur when the layers of air close to the ground undergo cooling with associated low wind speeds; (3) drainage winds occur under E and F stability conditions; and (4) neutral conditions (Class D) occur with cloudy skies and/or high wind speeds.

Figure D-1 illustrates smoke plume patterns from an elevated source for some of the various conditions discussed above. As a general rule, stable conditions of fumigation are the conditions which produce the highest groundlevel concentrations of air pollutants.

APPENDIX B

SPOKANE, WASHINGTON, NATIONAL

WEATHER SURFACE WIND DATA

STAR FORMAT

(1 JANUARY 1968 - 31 DECEMBER 1977)

RELATIVE FREQUENCY DISTRIBUTION NORMALIZED AVERAGE-ANNUAL BASIS
PASQUILL-GIFFORD STABILITY A

Direction	Wind Speed, Knots 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	Greater than 21	Total
N	.000054	.000171	.000000	.000000	.000000	.000000	.000225
NNE	.000032	.000103	.000000	.000000	.000000	.000000	.000135
NE	.000123	.000103	.000000	.000000	.000000	.000000	.000225
ENE	.000112	.000068	.000000	.000000	.000000	.000000	.000180
E	.000099	.000171	.000000	.000000	.000000	.000000	.000270
ESE	.000043	.000137	.000000	.000000	.000000	.000000	.000180
SE	.000032	.000103	.000000	.000000	.000000	.000000	.000135
SSE	.000032	.000103	.000000	.000000	.000000	.000000	.000135
S	.000099	.000171	.000000	.000000	.000000	.000000	.000270
SSW	.000045	.000000	.000000	.000000	.000000	.000000	.000045
SW	.000043	.000137	.000000	.000000	.000000	.000000	.000180
WSW	.000032	.000103	.000000	.000000	.000000	.000000	.000135
W	.000032	.000103	.000000	.000000	.000000	.000000	.000135
WNW	.000067	.000068	.000000	.000000	.000000	.000000	.000135
NW	.000032	.000103	.000000	.000000	.000000	.000000	.000135
NNW	.000045	.000000	.000000	.000000	.000000	.000000	.000045
TOTAL	.000925	.001644	.000000	.000000	.000000	.000000	

Relative Frequency of Occurrence of A Stability = .002568
Relative Frequency of Calms Distributed Above with A Stability = .000616

STABILITY B

Direction	1 - 3	4 - 6	Wind Speed, Knots 7 - 10	11 - 16	17 - 21	Greater than 21	Total
N	.000550	.001986	.000651	.000000	.000000	.000000	.003187
NNE	.000490	.001438	.000753	.000000	.000000	.000000	.002682
NE	.000734	.002123	.001130	.000000	.000000	.000000	.003987
ENE	.000733	.002089	.001644	.000000	.000000	.000000	.004465
E	.000673	.002363	.000548	.000000	.000000	.000000	.003584
ESE	.000761	.001096	.000342	.000000	.000000	.000000	.002200
SE	.000434	.000959	.000274	.000000	.000000	.000000	.001667
SSE	.000327	.000959	.000205	.000000	.000000	.000000	.001491
S	.000715	.001678	.000856	.000000	.000000	.000000	.003249
SSW	.000337	.001199	.000993	.000000	.000000	.000000	.002529
SW	.000703	.001404	.001267	.000000	.000000	.000000	.003374
WSW	.000432	.001747	.000856	.000000	.000000	.000000	.003035
W	.000324	.000890	.000548	.000000	.000000	.000000	.001762
WNW	.000486	.000514	.000240	.000000	.000000	.000000	.001240
NW	.000348	.000616	.000240	.000000	.000000	.000000	.001204
NNW	.000241	.000616	.000137	.000000	.000000	.000000	.00994
TOTAL	.008288	.021678	.010685	.000000	.000000	.000000	

Relative Frequency of Occurrence of B Stability = .040651
Relative Frequency of Calms Distributed Above with B Stability = .001233

STABILITY C

Direction	0 - 3	4 - 6	Wind Speed, Knots 7 - 10	11 - 16	17 - 21	Greater than 21	Total
N	.000381	.002295	.002192	.000103	.000034	.000000	.005004
NNE	.000234	.002192	.003082	.000137	.000000	.000000	.005645
NE	.000577	.003562	.008904	.000582	.000000	.000000	.013625
ENE	.000608	.003459	.008938	.000411	.000034	.000000	.013451
E	.000440	.003699	.003219	.000137	.000000	.000000	.007495
ESE	.000170	.001507	.002192	.000034	.000000	.000000	.003903
SE	.000204	.001473	.002363	.000000	.000000	.000000	.004040
SSE	.000214	.001712	.003836	.000000	.000000	.000000	.005762
S	.000306	.002192	.005856	.000445	.000000	.000000	.008799
SSW	.000191	.001164	.006336	.000822	.000068	.000034	.008616
SW	.000167	.001438	.006712	.001747	.000103	.000034	.010201
WSW	.000250	.001712	.005582	.001233	.000034	.000034	.008846
W	.000208	.001575	.003082	.000548	.000034	.000000	.005448
WNW	.000107	.000856	.000993	.000103	.000000	.000000	.002059
NW	.000250	.000856	.001199	.000068	.000000	.000000	.002373
NW	.000250	.000856	.001199	.000068	.000000	.000000	.002373
NNW	.000144	.000890	.000719	.000034	.000000	.000000	.001788
TOTAL	.004452	.030582	.065205	.006404	.000308	.000103	

Relative Frequency of Occurrence of C Stability = .107055

Relative Frequency of Calms Distributed Above with C Stability = .001404

STABILITY D

Direction	Wind Speed, Knots 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	Greater than 21	Total
N	.001579	.005753	.004555	.002363	.000205	.000000	.014456
NNE	.002292	.008151	.007774	.003390	.000377	.000068	.022053
NE	.002092	.011610	.020000	.005377	.000890	.000137	.040106
ENE	.002725	.011199	.019281	.006062	.000685	.000034	.039986
E	.002344	.006507	.005856	.001678	.000205	.000034	.016625
ESE	.001550	.004486	.006199	.001233	.000000	.000000	.013468
SE	.001592	.006370	.012260	.003836	.000034	.000034	.024126
SSE	.001296	.006370	.025171	.010514	.001130	.000000	.044481
S	.002149	.008664	.033562	.024555	.003767	.000445	.073142
SSW	.001059	.004829	.024863	.041610	.010856	.002260	.085477
SW	.001182	.004521	.025000	.049521	.019315	.007192	.106730
WSW	.001081	.003733	.014041	.022568	.007808	.002534	.051766
W	.001132	.003904	.006610	.008185	.002740	.000788	.023358
WNW	.000530	.001507	.001712	.001815	.000308	.000000	.005872
NW	.000413	.001438	.001712	.000514	.000034	.000034	.004146
NNW	.000647	.001130	.001370	.001267	.000274	.000034	.004723
TOTAL	.023664	.090171	.209966	.184486	.048630	.013596	

Relative Frequency of Occurrence of D Stability = .570514
Relative Frequency of Calms Distributed Above with D Stability = .008562

ED_002139_00005166-00009

STABILITY F

Direction	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	Greater than 21	Total
			Wind Speed, Knots				
N	.003271	.005000	.000000	.000000	.000000	.000000	.008271
NNE	.004371	.005788	.000000	.000000	.000000	.000000	.010158
NE	.004470	.008459	.000000	.000000	.000000	.000000	.012929
ENE	.004984	.010274	.000000	.000000	.000000	.000000	.015258
E	.005073	.005205	.000000	.000000	.000000	.000000	.010279
ESE	.002746	.003116	.000000	.000000	.000000	.000000	.005862
SE	.003336	.004212	.000000	.000000	.000000	.000000	.007548
SSE	.003029	.005925	.000000	.000000	.000000	.000000	.008954
S	.004393	.009178	.000000	.000000	.000000	.000000	.013571
SSW	.003303	.004486	.000000	.000000	.000000	.000000	.007789
SW	.003868	.006130	.000000	.000000	.000000	.000000	.009998
WSW	.003403	.006233	.000000	.000000	.000000	.000000	.009636
W	.003714	.004075	.000000	.000000	.000000	.000000	.007789
WNW	.001986	.001507	.000000	.000000	.000000	.000000	.003493
NW	.001049	.000959	.000000	.000000	.000000	.000000	.002008
NNW	.001456	.000993	.000000	.000000	.000000	.000000	.002449
TOTAL	.054452	.081541	.000000	.000000	.000000	.000000	

Relative Frequency of Occurrence of F Stability = .135993
Relative Frequency of Calms Distributed above with F Stability = .020000

STABILITY E

Direction	Wind Speed, Knots 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	Greater than 21	Total
N	.000000	.004144	.002226	.000000	.000000	.000000	.006370
NNE	.000000	.004795	.002363	.000000	.000000	.000000	.007158
NE	.000000	.007397	.005959	.000000	.000000	.000000	.013356
ENE	.000000	.008116	.007842	.000000	.000000	.000000	.015959
E	.000000	.004726	.001678	.000000	.000000	.000000	.006404
ESE	.000000	.003459	.000411	.000000	.000000	.000000	.003870
SE	.000000	.004178	.003425	.000000	.000000	.000000	.007603
SSE	.000000	.005856	.014966	.000000	.000000	.000000	.020822
S	.000000	.006986	.011267	.000000	.000000	.000000	.018253
SSW	.000000	.003219	.006027	.000000	.000000	.000000	.009247
SW	.000000	.004110	.009760	.000000	.000000	.000000	.013870
WSW	.000000	.003596	.007534	.000000	.000000	.000000	.011130
W	.000000	.002397	.002055	.000000	.000000	.000000	.004452
WNW	.000000	.001164	.000685	.000000	.000000	.000000	.001849
NW	.000000	.000788	.000753	.000000	.0000000	.000000	.001541
NNW	.000000	.000582	.000753	.000000	.000000	.000000	.001336
TOTAL	.000000	.065514	.077705	.000000	.000000	.000000	

Relative Frequency of Occurrence of E Stability = .143219
Relative Frequency of Calms Distributed above with E Stability = .000000

APPENDIX C

Birds Known or Expected In The General Region Of The Spokane Reservation

Common Name	Scientific Name
Order Gaviiformes	
Common loon	Gavia immer
Order Policipediformes	
Red-necked Grebe	Podiceps grisegena
Horned Grebe	Podiceps auritus
Eared Grebe	Podiceps nigricollis
Western Grebe	Aechmorphorus occidentalis
Pied-billed Grebe	Podilymbus podiceps
Order Pelecaniformes	
White Pelican	Pelecanus erythrorhynchos
Order Ciconiiformes	
Great Blue Heron	Ardea herodias
American Bittern	Botaurus lentiginosus
Order Anseriformes	
Whistling Swan	Cygnus columbianus
Trumpeter Swan	Cygnus buccinator
Canada Goose	Branta canadensis
Snow Goose	Chen caerulescens
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
Green-winged Teal	Anas carolinensis
Blue-winged Teal	Anas discors
Cinnamon Teal	Anas cyanoptera
American Wigeon	Anas americana
Shoveler	Spatula clypeata
Wood Duck	Aix sponsa
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Canvasback	Aythya valisineria
Lesser Scaup	Aythya affinis
Barrow's Goldeneye	Bucephala islandica
Common Goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
White-winged Scoter	Melanitta fusca

Common Name	Scientific Name
Order Anseriformes cont'd.	
Ruddy Duck	Oxyura jamaicensis
Common Merganser	Mergus merganser
Hooded Merganser	Lophodytes cucullatus
Order Falconiformes	
Turkey Vulture	Cathartes aura
Goshawk	Accipiter gentilis
Sharp-shinned Hawk	Accipiter striatus
Cooper's Hawk	Accipiter cooperii
Red-tailed Hawk	Buteo jamaicensis
Swainson's Hawk	Buteo swainsoni
Rough-legged Hawk	Buteo lagopus
Ferruginous Hawk	Buteo regalis
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Marsh Hawk	Circus cyaneus
Osprey	Pandion haliaetus
Gyrfalcon	Falco rusticolus
Prairie Falcon	Falco mexicanus
Peregrine Falcon	Falco peregrinus
Merlin	Falco columbarius
American Kestrel	Falco sparverius
Order Galliformes	
Wild Turkey	Meleagris gallopavo
Blue Grouse	Dendragapus obscurus
Ruffed Grouse	Bonasa umbellus
Sharp-tailed Grouse	Tympanuchus phasianellus
Gray Partridge	Perdix perdix
Bobwhite	Colinus virginianus
California Quail	Lophortyx californicus
Ring-necked Pheasant	Phasianus colchicus
Chukar	Alectoris chukar
Order Gruiformes	
Sandhill Crane	Grus canadensis
Virginia Rail	Rallus limicola

Common Name	Scientific Name
Order Gruiformes cont'd.	
Sora	Porzana carolina
American Coot	Fulica americana
Order Charadriiformes	
Killdeer	Charadrius vociferus
Black-bellied Plover	Pluvialis squatarola
Common Snipe	Gallinago gallinago
Long-billed Curlew	Numenius americanus
Upland Sandpiper	Bartramia longicauda
Spotted Sandpiper	Actitis macularia
Solitary Sandpiper	Tringa solitaria
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes
Pectoral Sandpiper	Calidris melanotos
Baird's Sandpiper	Calidris bairdii
Least Sandpiper	Calidris minutilla
Dunlin	Calidris alpina
Stilt Sandpiper	Calidris himantopus
Western Sandpiper	Calidris mauri
Long-billed Dowitcher	Limnodromus scolopaceus
American Avocet	Recurvirostra americana
Wilson's Phalarope	Phalaropus tricolor
Northern Phalarope	Phalaropus lobatus
Herring Gull	Larus argentatus
California Gull	Larus Californicus
Ringed-billed Gull	Larus delawarensis
Bonaparte's Gull	Larus philadelphia
Forster's Tern	Sterna forsteri
Caspian Tern	Sterna caspia
Black Tern	Chlidonias niger
Order Columbiformes	
Mourning Dove	Zenaida macroura
Rock Dove	Columba livia
Band-tailed Pigeon	Columbia fasciata
Order Strigiformes	
Barn Owl	Tyto alba
Screech Owl	Otus asio
Flammulated Owl	Otus flammeolus

Common Name	Scientific Name
Order Strigiformes cont'd.	
Great Horned Owl	Bubo virginianus
Snowy Owl	Nyctea scandiaca
Northern Hawk-Owl	Surnia ulula
Northern Pygmy-Owl	Glaucidium gnoma
Burrowing Owl	Athene cunicularia
Barred Owl	Strix varia
Great Gray Owl	Strix nebulosa
Long-eared Owl	Asio otus
Short-eared Owl	Asio flammeus
Saw-whet Owl	Aegolius acadicus
Order Caprimulgiformes	
Poor-will	Phalaenoptilus nuttallii
Common Nighthawk	Chordeiles minor
Order Apodiformes	
White-throated Swift	Aeronautes saxatilis
Vaur's Swift	Chaetura vauxi
Black-chinned Hummingbird	Archilochus alexandri
Rufous Hummingbird	Selasphorus rufus
Calliope Hummingbird	Stellula calliope
Order Coraciiformes	
Belted Kingfisher	Ceryle alcyon
Order Piciformes	
Common Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
Lewis' Woodpecker	Melanerpes lewis
Yellow-bellied Sapsucker	Sphyrapicus varius
Williamson's Sapsucker	Sphyrapicus thyroideus
Hairy Woodpecker	Picoides villosus
Downy Woodpecker	Picoides pubescens
White-headed Woodpecker	Picoides albolarvatus
Black-backed Woodpecker	Picoides arcticus
Three-toed Woodpecker	Picoides tridactylus

Common Name	Scientific Name
Order Passeriformes.	
Eastern Kingbird	Tyrannus tyrannus
Western Kingbird	Tryannus verticalis
Ash-throated Flycatcher	Myiarchus cinerascens
Say's Phoebe	Sayornis saya
Willow Flycatcher	Empidonax traillii
Least Flycatcher	Empidonax minimus
Hammond's Flycatcher	Empidonax hammondii
Dusky Flycatcher	Empidonax oberholseri
Western Flycatcher	Empidonax difficilis
Western Wood Pewee	Contopus sordidulus
Olive-sided Flycatcher	Contopus borealis
Horned Lark	Eremophila alpestris
Violet-green Swallow	Tachycineta thalassina
Tree Swallow	Tachycineta bicolor
Bank Swallow	Riparia riparia
Rough-winged Swallow	Stelgidopteryx serripennis
Barn Swallow	Hirundo rustica
Cliff Swallow	Hirundo pyrrhonota
Gray Jay	Perisoreus canadensis
Steller's Jay	Cyanocitta stelleri
Black-billed Magpie	Pica pica
Common Raven	Corvus corax
Common Crow	Corvus brachyrhynchos
Clark's Nutcracker	Nucifraga columbiana
Black-capped Chickadee	Parus atricapillus
Mountain Chickadee	Parus gambeli
Chestnut-backed Chickadee	Parus rufescens
White-breasted Nuthatch	Sitta carolinensis
Red-breasted Nuthatch	Sitta canadensis
Pygmy Nuthatch	Sitta pygmaea
Brown Creeper	Certhia familiaris
Dipper	Cinclus mexicanus
House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
Marsh Wren	Cistothorus palustris
Canyon Wren	Catherpes mexicanus
Rock Wren	Salpinctes obsoletus
Catbird	Dumetella carolinensis
Sage Thrasher	Oreoscoptes montana
Robin	Turdus migratorius
Varied Thrush	Ixoreus naevius
Hermit Thrush	Catharus guttatus
Swainson's Thrush	Catharus ustulatus
Veery	Catharus fuscescens

Common Name	Scientific Name
Order Passeriformes cont'd.	
Western Bluebird	Sialia mexicana
Mountain Bluebird	Sialia currucoides
Townsend's Solitaire	Myadestes townsendii
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Water Pipit	Anthus spinoletta
Bohemian Waxwing	Bombycilla garrulus
Cedar Waxwing	Bombycilla cedrorum
Northern Shrike	Lanius excubitor
Loggerhead Shrike	Lanius ludovicianus
Starling	Sturnus vulgaris
Solitary Vireo	Vireo solitarius
Red-eyed Vireo	Vireo olivaceus
Warbling Vireo	Vireo gilvus
Orange-crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
Yellow Warbler	Dendroica petechia
Yellow-rumped Warbler	Dendroica coronata
Townsend Warbler	Dendroica townsendi
Common Yellowthroat	Geothypis trichas
Yellow-breasted Chat	Icteria virens
MacGillivray's Warbler	Oporornis tolmiei
Wilson's Warbler	Wilsonia pusilla
American Redstart	Setophaga ruticilla
House Sparrow	Passer domesticus
Bobolink	Dolichonyx oryzivorus
Western Meadowlark	Sturnella neglecta
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Red-winged Blackbird	Agelaius phoeniceus
Northern Oriole	Icterus galbula
Brewer's Blackbird	Euphagus cyanocephalus
Brown-headed Cowbird	Molothrus ater
Western Tanager	Piranga ludoviciana
Black-headed Grosbeak	Pheucticus melanocephalus
Lazuli Bunting	Passerina amoena
Evening Grosbeak	Hesperiphona vespertinus
Cassin's Finch	Carpodacus cassinii
House Finch	Carpodacus mexicanus
Pine Grosbeak	Pinicola enucleator
Gray-crowned Rosy Finch	Leucosticte tephrocotis
Common Redpoll	Acanthis flammea
Pine Siskin	Carduelis pinus
American Goldfinch	Carduelis tristis
Red Crossbill	Loxia curvirostra
Rufus-sided Towhee	Pipilo erythrophthalmus
Savannah Sparrow	Passerculus sandwichensis

Common Name	Scientific Name
Order Passeriformes cont'd.	
Grasshopper Sparrow	Ammodramus savannarum
Vesper Sparrow	Pooecetes gramineus
Lark Sparrow	Chondestes grammacus
Oregon Junco	Junco oreganus
Dark-eyed Junco	Junco hyemalis
Tree Sparrow	Spizella arborea
Chipping Sparrow	Spizella passerina
Brewer's Sparrow	Spizella breweri
White-crowned Sparrow	Zonotrichia leucophrys
Fox Sparrow	Passerella iliaca
Lincoln's Sparrow	Melospiza lincolnii
Song Sparrow	Melospiza melodia
Snow Bunting	Plectrophenax nivalis

Source: Dames and Moore 1974; Larrison 1981 Nisbet n.d., and Robbins et. al. 1966.

APPENDIX D

TABLE OF CONTENTS

"THE NORTHERN CHEYENNE

AIR QUALITY REDESIGNATION

REPORT AND REQUEST"

TABLE OF CONTENTS

NORTHERN CHEYENNE AIR QUALITY
REDESIGNATION REPORT AND REQUEST

APPENDIX E

SPOKANE RESERVATION

SOILS $_{p}H$

SPOKANE RESERVATION SOIL pH AND DEPTH BY SOIL MAP UNITS

Soil Series (Map Units)	Depth (inches)	Reaction (pH)
Moscow (159, 160, 161)	0-26	5.1-6.5
Saltese (202)	0-60	5.6-6.5
Huckleberry (105, 106, 107)	0-28 21-32	5.6-7.3 5.6-6.5
Newbell (166, 167); Springdale (225, 226, 227)	0-6	5.6-7.3
Skanid (209, 210, 211); Mobate (151, 152)	0-15	6.1-7.3
Buhrig (44)	0-22	6.1-7.3
Spens (216, 217); Spokane (218, 219, 221, 222, 223, 224), Rock outcrop Spokane (196	0-26	6.1-7.3
Dragoon (78, 79); Raisio (178, 180)	0-30	6.1-7.3
Hartill (90, 93, 94)	0-37	6.1-7.3
Aits (9, 10); Bernhill (19, 20, 21, 22, 23, 26); Bestrom (27, 29); Bong (32, 33); Clayton (56, 57); Dearyton (61, 62); Dehart (69); Donovan (70, 71, 72, 74, 75); Green Bluff (86, 87); Hardesty (70); Hesseltine (95, 96, 97); Konner (121); Laketon (126, 127); Marble (142); Narcisse (164); Phoebe (174, 175); Wethey (246)	0-6	6.1-7.3
Peone (172, 173)	0-43 43-60	6.1-7.3 5.6-7.3
Cedonia (45, 46)	0-8 8-32 32-60	6.1-7.3 6.6-8.4 7.9-9.0
Republic (184, 185)	0-31 31-60	6.1-7.3 6.6-8.4
Hogson (99)	0-10 10-28 28-60	6.1-7.3 6.6-8.4 7.4-9.0

Soil Series (Map Units)	Depth (inches)	Reaction (pH)
Hunters (108, 109)	0-18	6.1-7.3
	18-30	6.6-8.4
	30-60	7.9-8.4
Ratdrum (181)	0-60	6.6-7.3
Rock outcrop Stevents (197)	0-38	6.6-7.3
	38-60	6.6-7.8
Stevens (230, 231)	0-60	6.6-7.3
Stevens (229, 232, 234)	0-38	6.6-7.3
	38-60	6.6-7.8
Cheney (53, 54)	0-24	6.6-7.8
	24-60	7.4-7.4
Cheney (52)	0-60	6.6-7.8
Koerling (118, 119)	0-9	6.6-7.3
	9-40	6.6-7.8
	40-60	7.4-8.4
Brigesdon (39, 40); Garrison (83, 84)	0-60	6.6-7.8
Colville (58, 59)	0-60	7.4-9.0
Molcal (193)	0-18	7.4-8.4
	18-47	7.9-9.0

APPENDIX F

WATER QUALITY DATA

STORET RETRIEVAL DATE 84/06/18 - INVENT - VERSION OF SEP, 1981

RETRIEVAL FOR DICK PEARL

12433000 543106 54A070
47 50 18.0 117 51 05.0 2
SPOKANE RIVER AT LONG LAKE, WASH.
53063 WASHINGTON SPOKANE
130391

/TYPA/AMBNT/STREAM

112WRD 17010307000
0000 CLASS 00 CSN-RSP 0016510-0287010

INDEX 1310001 006500
MILES 0643.00 0033.30

PARAMETER				RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00003 VSAMPLOC	DEPTH		FEET		1	4.19999					4.19999	4.19999	73/01/31	73/01/31
00008 LAB	IDENT.		NUMBER		16	236404	.129E+12	360040	1.52302	90011.8	760832	305.000	73/05/11	75/09/24
00010 WATER	TEMP		CENT		370	12.0431	33.5980	5.79638	.481302	.301340	23.0000	.500000	62/10/24	83/11/17
00020 AIR	TEMP		CENT		4	16.3750	53.4697	7.31230	.446553	3.65615	25.4000	9.10000	83/05/19	83/11/17
00022 LENGTH	OF EXPOS		URE-DAYS		3	36.0000	111.000	10.5356	.292657	6.08275	47.0000	26.0000	78/05/02	79/07/30
00025 BAROMTRC	PRESSURE		MM OF HG		7	722.428	69.6667	8.34666	.011554	3.15474	732.000	710.000	82/10/27	83/11/17
00027 COLLECT	AGENCY		CODE		73	14873.9	.990E+09	31471.8	2.11591	3683.50	85343.0	.102800	75/07/23	83/11/17
00028 ANALYZE	AGENCY		CODE		89	37416.4	.156E+10	39595.4	1.05824	4197.10	80020.0	1028.00	75/07/23	83/11/17
00060 STREAM	FLOW		CFS		169	8481.92	.567E+08	7534.11	.888255	579.547	42300.0	180.000	59/10/29	74/03/25
00061 STREAM	FLOW,		INST-CFS		165	8003.78	.551E+08	7425.76	.927781	578.094	42299.9	150.000	71/10/13	83/11/17
00070 TURB	JKSN		JTU		137	7.31383	111.937	10.5801	1.44658	.903915	70.0000	.000000	70/11/30	78/05/02
00076 TURB	TRBIDMTR		HACH FTU		54	3.16111	23.1850	4.81508	1.52323	.655250	23.0000	.300000	78/05/22	83/11/17
00080 COLOR	PT-CO		UNITS		182	12.0769	267.993	16.3705	1.35552	1.21346	123.000	.000000	59/10/29	77/07/25
00095 CNDUCTVY	AT 25C		MICROMHO		333	132.057	1923.67	43.8596	.332127	2.40349	260.000	50.9999	59/10/29	83/11/17
00300 DO			MG/L		309	9.04034	10.0410	3.16876	.350513	.180264	16.9000	2.90000	62/10/24	83/11/17
00310 BOD	5 DAY		MG/L		22	1.47727	.474229	.688643	.466160	.146819	2.90000	.400000	72/10/11	73/09/25
00400 PH			SU		328	7.44737	.129862	.360364	.048388	.019898	8.99999	6.50000	59/10/29	83/11/17
00403 LAB	PH		SU		25	7.74000	.068349	.261437	.033777	.052287	8.30000	7.00000	80/10/21	83/11/17
00405 CO2			MG/L		76	4.12498	24.9474	4.99473	1.21085	.572935	32.0000	.100000	60/07/28	78/05/02
00410 T ALK	CACO3		MG/L		205	51.3020	394.592	19.8643	.387204	1.38738	107.000	17.0000	59/10/29	80/09/22
00440 HCO3 ION	HCO3		MG/L		248	62.6884	645.783	25.4123	.405374	1.61368	130.000	21.0000	59/10/29	78/05/02
00445 CO3 ION	CO3		MG/L		220	.000000	.000000	.000000		.000000	.000000	.000000	59/10/29	78/05/02
00515 RESIDUE	DISS-105	C	MG/L		28	79.7500	495.310	22.2566	.279067	4.20591	120.000	44.0000	71/11/02	75/09/24
00530 RESIDUE	TOT NFLT		MG/L		50	10.9800	230.632	15.1866	1.38311	2.14771	71.0000	.000000	71/11/02	78/09/15
				K	2	1.000000	.953E-06	.000977	.000977	.000691	1.00000	1.000000	71/11/29	75/09/24
				TOT	52	10.5961	225.344	15.0114	1.41669	2.08171	71.0000	.000000	71/11/02	78/09/15
00572 BIOMASS	PERPHYTN		G/SQ M		13	2.48376	6.56336	2.56190	1.03146	.710544	7.70000	.079000	74/07/25	80/10/21
00573 BIOMASS	PERPHYTN		DW G/M2		12	3.41991	10.7807	3.28340	.960083	.947836	11.0000	.079000	74/10/22	80/10/21
00600 TOTAL N	N		MG/L		90	1.05510	.302028	.549571	.520868	.057930	3.90000	.270000	73/10/30	81/09/16
00602 DISS.	NITROGEN		MG/L N		25	.850798	.048661	.220592	.259277	.044118	1.30000	.350000	79/09/19	81/09/16
00605 ORG N	N		MG/L		110	.419269	.213252	.461793	1.10142	.044030	3.20000	.010000	72/07/12	81/09/16
00607 ORG N	DISS-N		MG/L		24	.386667	.012910	.113623	.293864	.023193	.630001	.180000	79/10/10	81/09/16
00608 NH3+NH4-	N DISS		MG/L		36	.091389	.003532	.059433	.650337	.009906	.310000	.000000	79/10/10	83/11/17
				K	1	.060000					.060000	.060000	83/09/21	83/09/21
				TOT	37	.090540	.003461	.058829	.649754	.009671	.310000	.000000	79/10/10	83/11/17
00610 NH3+NH4-	N TOTAL		MG/L		147	.152922	.011621	.107802	.704947	.008891	.540000	.000000	70/11/30	81/09/16
				K	6	.010000	-.931E-10	.000000		.000000	.010000	.010000	78/04/06	79/05/15
				TOT	153	.147317	.011937	.109258	.741648	.008833	.540000	.000000	70/11/30	81/09/16
00613 NO2-N	DISS		MG/L		42	.017619	.000916	.030268	1.71791	.004670	.190000	.000000	70/11/30	81/09/16
00615 NO2-N	TOTAL		MG/L		62	.016693	.000113	.010616	.635962	.001348	.060000	.004000	70/11/30	81/07/21
				K	6	.010000	-.931E-10	.000000		.000000	.010000	.010000	75/06/27	77/07/25

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STORET RETRIEVAL DATE 84/06/18 - INVENT - VERSION OF SEP, 1981

RETRIEVAL FOR DICK PEARL

12433000 543106 54A070
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SPOKANE RIVER AT LONG LAKE, WASH.
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112WRD 17010307000
0000 CLASS 00 CSN-RSP 0016510-0287010

INDEX 1310001 006500
MILES 0643.00 0033.30

PARAMETER				RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00615	NO2-N	TOTAL	MG/L	TOT	68	.016103	.000106	.010309	.640190	.001250	.060000	.004000	72/10/11	77/09/29
00618	NO3-N	DISS	MG/L		44	.332045	.065421	.255775	.770304	.038560	1.10000	.040000	60/07/28	81/07/21
00620	NO3-N	TOTAL	MG/L		67	.398951	.026881	.163956	.410966	.020030	.939999	.050000	72/10/11	77/09/29
00623	KJELDL N	DISS	MG/L		48	.354375	.024481	.156463	.441520	.022584	.680001	.080000	77/10/20	81/09/16
00624	KJELDL N	SUSP	MG/L		44	.382499	.381724	.617838	1.61526	.093143	2.90000	.000000	78/02/07	81/09/16
00625	TOT KJEL	N	MG/L		105	.509507	.157727	.397149	.779477	.029199	3.30000	.020000	70/11/30	83/11/17
00630	NO2&NO3	N-TOTAL	MG/L		94	.450952	.065829	.256573	.568957	.026463	1.30000	.030000	73/10/30	81/09/16
00631	NO2&NO3	N-DISS	MG/L		37	.425135	.039987	.199967	.470362	.032874	.790001	.080000	79/09/19	83/11/17
00633	NO2&NO3	MUD D WT	MG/KG-N		1	1.30000					1.30000	1.30000	73/10/30	73/10/30
00650	T PO4	PO4	MG/L		67	.159702	.029591	.172020	1.07713	.021016	1.40000	.020000	60/07/28	79/06/13
00660	ORTHOPO4	PO4	MG/L		98	.296321	2.00448	1.41580	4.77791	.143017	14.0000	.000000	59/10/29	83/01/21
00665	PHOS-TOT		MG/L P		186	.068225	.001932	.043957	.644293	.003223	.250000	.010000	70/11/30	83/11/17
				K	4	.010000	.000000	.000000		.000000	.010000	.010000	78/08/01	82/10/27
				TOT	190	.066999	.001962	.044290	.661045	.003213	.250000	.010000	70/11/30	83/11/17
00666	PHOS-DIS		MG/L P		77	.045558	.004435	.066594	1.46175	.007589	.500000	.010000	72/10/11	83/11/17
				K	6	.010000	.931E-10	.000000		.000000	.010000	.010000	78/05/02	83/09/21
				TOT	83	.042988	.004196	.064778	1.50689	.007110	.500000	.010000	72/10/11	83/11/17
00668	PHOS MUD	DRY WGT	MG/KG-P		1	210.000					210.000	210.000	73/10/30	73/10/30
00671	PHOS-DIS	ORTHO	MG/L P		110	.041781	.001352	.036764	.879913	.003505	.260000	.000000	70/11/30	83/11/17
				K	5	.010000	.000000	.000000		.000000	.010000	.010000	76/05/11	83/09/21
				TOT	115	.040400	.001335	.036533	.904300	.003407	.260000	.000000	70/11/30	83/11/17
00680	T ORG C	C	MG/L		74	5.51750	113.154	10.6374	1.92794	1.23657	78.0000	.000000	72/10/11	81/09/16
00681	D ORG C	C	MG/L		15	2.08666	.928390	.963530	.461756	.248782	4.50000	.700000	78/01/02	81/07/21
00689	S ORG C	C	MG/L		13	.276923	.041923	.204751	.739379	.056788	.800000	.100000	78/01/02	81/07/21
00745	SULFIDE	TOTAL	MG/L		1	.800000					.800000	.800000	82/05/19	82/05/19
00900	TOT HARD	CACO3	MG/L		321	58.0495	443.512	21.0597	.362789	1.17544	106.000	22.0000	59/10/29	83/03/22
00902	NC HARD	CACO3	MG/L		279	6.57701	12.1011	3.47866	.528912	.208262	19.0000	.000000	59/10/29	81/02/17
00915	CALCIUM	CA,DISS	MG/L		325	14.6319	24.6130	4.96115	.339064	.275195	28.0000	5.90000	59/10/29	83/11/17
00925	MGNSIUM	MG,DISS	MG/L		325	5.31314	6.52150	2.55372	.480643	.141655	30.0000	1.60000	59/10/29	83/11/17
00930	SODIUM	NA,DISS	MG/L		303	3.13190	.819079	.905030	.288971	.051993	6.79999	.789999	59/10/29	83/11/17
00931	SODIUM	ADSBTION	RATIO		237	.196200	.001724	.041519	.211614	.002697	.500000	.100000	59/10/29	83/03/22
00932	PERCENT	SODIUM	%		219	10.8916	5.36522	2.31629	.212668	.156521	24.0000	.270000	59/10/29	83/03/22
00933	NA+K		MG/L		11	4.97272	1.24424	1.11545	.224314	.336322	6.40000	2.70000	79/05/15	80/03/12
00935	PTSSIUM	K,DISS	MG/L		303	1.40540	.221672	.470820	.335007	.027048	5.30000	.150000	59/10/29	83/11/17
00940	CHLORIDE	TOTAL	MG/L		303	2.17221	1.68230	1.29703	.597104	.074513	10.0000	.100000	59/10/29	83/11/17
00945	SULFATE	SO4-TOT	MG/L		325	9.97930	4.35873	2.08776	.209209	.115808	17.0000	1.80000	59/10/29	83/11/17
00950	FLUORIDE	F,DISS	MG/L		269	.152040	.006984	.083569	.549655	.005095	.500000	.000000	59/10/29	82/10/27
				K	15	.100000	.425E-07	.000206	.002063	.000053	.100000	.100000	73/04/23	83/11/17
				TOT	284	.149291	.006750	.082156	.550309	.004875	.500000	.000000	59/10/29	83/11/17
00955	SILICA	DISOLVED	MG/L		262	9.33466	3.41049	1.84675	.197838	.114093	16.0000	.900000	59/10/29	83/11/17
01000	ARSENIC	AS,DISS	UG/L		56	1.62500	3.51136	1.87386	1.15315	.250405	10.00000	.000000	59/12/02	83/11/17

STORET RETRIEVAL DATE 84/06/18 - INVENT - VERSION OF SEP. 1981

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PARAMETER			RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
01000 ARSENIC	AS,DISS	UG/L	K	2	1.00000	.000000	.000000		.000000	1.00000	1.00000	73/10/30	76/01/22
			TOT	58	1.60345	3.40139	1.84429	1.15020	.242167	10.00000	.000000	59/12/02	83/11/17
01001 ARSENIC	AS,SUSP	UG/L		20	1.00000	1.57895	1.25656	1.25656	.280976	4.00000	.000000	73/10/30	82/07/21
			K	10	1.00000	.000000	.000000		.000000	1.00000	1.00000	74/04/23	78/08/01
			TOT	30	1.00000	1.03448	1.01709	1.01709	.185695	4.00000	.000000	73/10/30	82/07/21
01002 ARSENIC	AS,TOT	UG/L		37	1.97297	1.13814	1.06684	.540726	.175387	5.00000	.999999	73/01/31	82/07/21
			K	1	1.00000					1.00000	1.00000	73/07/23	73/07/23
			TOT	38	1.94737	1.13230	1.06409	.546427	.172619	5.00000	.999999	73/01/31	82/07/21
01005 BARIUM	BA,DISS	UG/L		22	27.8182	65.3945	8.08669	.290690	1.72409	50.0000	20.0000	78/08/01	83/11/17
			K	3	100.000	.000000	.000000		.000000	100.000	100.000	77/10/20	78/04/06
			TOT	25	36.4800	630.344	25.1066	.688230	5.02133	100.000	20.0000	77/10/20	83/11/17
01006 BARIUM	BA,SUSP	UG/L		18	82.2222	28077.1	167.562	2.03792	39.4948	700.000	.000000	77/10/20	82/07/21
01007 BARIUM	BA,TOT	UG/L		11	127.273	42181.8	205.382	1.61372	61.9250	700.000	.000000	77/10/20	82/07/21
			K	9	100.000	.000000	.000000		.000000	100.000	100.000	78/01/02	82/05/19
			TOT	20	115.000	22394.7	149.649	1.30129	33.4625	700.000	.000000	77/10/20	82/07/21
01010 BERYLIUM	BE,DISS	UG/L	K	5	.500000	.000000	.000000		.000000	.500000	.500000	82/10/27	83/11/17
01020 BORON	B,DISS	UG/L		15	20.6667	478.095	21.8654	1.05800	5.64561	80.0000	.000000	61/01/24	69/08/09
01025 CADMIUM	CD,DISS	UG/L		7	3.85714	24.4762	4.94734	1.28264	1.86992	15.0000	1.00000	74/04/23	83/11/17
			K	27	1.51852	.259260	.509176	.335311	.097991	2.00000	1.00000	73/01/31	83/09/21
			U	10	.000000	.000000	.000000		.000000	.000000	.000000	73/04/23	77/10/20
			TOT	44	1.54545	4.99789	2.23560	1.44656	.337029	15.0000	.000000	73/01/31	83/11/17
01026 CADMIUM	CD,SUSP	UG/L		18	2.61111	28.7222	5.35931	2.05250	1.26320	19.0000	.000000	73/10/30	81/04/21
			K	9	9.44444	.277832	.527098	.055810	.175699	10.0000	9.00000	74/07/26	77/10/20
			TOT	27	4.88889	29.6410	5.44436	1.11362	1.04777	19.0000	.000000	73/10/30	81/04/21
01027 CADMIUM	CD,TOT	UG/L		15	3.46666	45.4094	6.73865	1.94384	1.73991	20.0000	.000000	73/01/31	82/07/21
			K	22	15.0909	67.3249	8.20516	.543717	1.74935	20.0000	2.00000	73/04/23	79/07/30
			U	2	.000000	.000000	.000000		.000000	.000000	.000000	75/10/22	78/10/17
			TOT	39	9.84615	91.0284	9.54088	.968996	1.52776	20.0000	.000000	73/01/31	82/07/21
01030 CHROMIUM	CR,DISS	UG/L		41	3.39024	46.7438	6.83695	2.01665	1.06775	30.0000	.000000	59/12/02	82/05/19
			K	11	8.63636	68.4546	8.27373	.958011	2.49462	20.0000	1.00000	75/01/21	83/11/17
			U	23	.000000	.000000	.000000		.000000	.000000	.000000	73/01/31	79/07/30
			TOT	75	3.12000	42.1070	6.48899	2.07981	.749284	30.0000	.000000	59/12/02	83/11/17
01031 CHROMIUM	CR,SUSP	UG/L		31	3.38710	48.9785	6.99846	2.06621	1.25696	25.0000	.000000	73/10/30	81/10/20
			K	1	10.0000					10.0000	10.0000	77/04/18	77/04/18
			TOT	32	3.69375	48.7651	6.98320	1.94315	1.23447	25.0000	.000000	73/10/30	81/10/20
01032 CHROMIUM	HEX-VAL	UG/L		1	.000000					.000000	.000000	71/06/01	71/06/01
01034 CHROMIUM	CR,TOT	UG/L		42	4.09523	66.4785	8.15343	1.99096	1.25810	30.0000	.000000	67/02/22	82/07/21
			K	9	16.6667	25.0004	5.00004	.300003	1.66668	20.0000	10.0000	74/07/25	82/05/19
			U	17	.000000	.000000	.000000		.000000	.000000	.000000	73/04/23	79/07/30
			TOT	68	4.73529	68.7348	8.29064	1.75082	1.00539	30.0000	.000000	67/02/22	82/07/21
01035 COBALT	CO,DISS	UG/L		4	1.75000	.250000	.500000	.285714	.250000	2.00000	1.00000	75/07/23	82/05/19

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PARAMETER				RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
01035	COBALT	CO,DISS	UG/L	K	21	2.80952	.261908	.511769	.182155	.111677	3.00000	1.00000	73/01/31	83/11/17
				U	19	.000000	.000000	.000000		.000000	.000000	.000000	73/04/23	78/08/01
				TOT	44	1.50000	1.97674	1.40597	.937311	.211957	3.00000	.000000	73/01/31	83/11/17
01036	COBALT	CO,SUSP	UG/L		15	8.40000	326.257	18.0626	2.15031	4.66374	50.0000	.000000	73/10/30	80/04/08
				K	11	49.6363	.656641	.810334	.016325	.244325	50.0000	48.0000	74/04/23	77/10/20
				TOT	26	25.8461	614.616	24.7914	.959193	4.86200	50.0000	.000000	73/10/30	80/04/08
01037	COBALT	CO,TOTAL	UG/L		11	3.18181	53.7635	7.33236	2.30446	2.21079	25.0000	.000000	73/07/23	82/01/19
				K	23	67.5652	2092.89	45.7482	.677097	9.53915	100.000	1.00000	73/01/31	82/07/21
				U	5	.000000	.000000	.000000		.000000	.000000	.000000	74/07/25	79/07/30
				TOT	39	40.7436	2288.09	47.8339	1.17402	7.65956	100.000	.000000	73/01/31	82/07/21
01040	COPPER	CU,DISS	UG/L		80	9.81241	516.129	22.7185	2.31528	2.54000	130.000	.000000	59/12/02	83/11/17
				K	7	12.2857	92.5715	9.62141	.783138	3.63655	20.0000	2.00000	73/07/23	77/07/13
				TOT	87	10.0114	481.035	21.9325	2.19075	2.35141	130.000	.000000	59/12/02	83/11/17
01041	COPPER	CU,SUSP	UG/L		30	8.70000	60.6311	7.78660	.895011	1.42163	31.0000	.000000	73/10/30	82/07/21
				K	5	6.00000	9.00000	3.00000	.500000	1.34164	9.00000	1.00000	74/10/22	77/10/20
				TOT	35	8.31429	53.6925	7.32752	.881316	1.23858	31.0000	.000000	73/10/30	82/07/21
01042	COPPER	CU,TOT	UG/L		43	14.2093	741.643	27.2331	1.91657	4.15301	170.000	.000000	70/11/30	82/07/21
				K	11	20.0000	.000000	.000000		.000000	20.0000	20.0000	74/01/22	79/04/23
				U	2	.000000	.000000	.000000		.000000	.000000	.000000	75/10/22	76/07/06
				TOT	56	14.8393	579.990	24.0830	1.62292	3.21822	170.000	.000000	70/11/30	82/07/21
01044	IRON	FE,SUSP	UG/L		13	107.692	5269.23	72.5895	.674045	20.1327	210.000	10.0000	78/08/01	82/07/21
01045	IRON	FE,TOT	UG/L		58	351.551	497310	705.202	2.00597	92.5975	4000.00	30.0000	62/11/20	82/07/21
01046	IRON	FE,DISS	UG/L		53	38.5093	1158.72	34.0400	.883941	4.67575	150.000	.000000	60/02/16	83/11/17
				K	13	9.46154	3.76925	1.94145	.205194	.538463	10.0000	3.00000	75/01/21	83/09/21
				TOT	66	32.7878	1063.19	32.6065	.994472	4.01359	150.000	.000000	60/02/16	83/11/17
01049	LEAD	PB,DISS	UG/L		59	6.96609	105.481	10.2704	1.47434	1.33709	67.0000	.000000	71/08/15	83/11/17
				K	3	2.00000	.000000	.000000		.000000	2.00000	2.00000	74/01/22	79/04/23
				U	4	.000000	.000000	.000000		.000000	.000000	.000000	76/10/12	79/07/30
				TOT	66	6.31817	97.8199	9.89040	1.56539	1.21742	67.0000	.000000	71/08/15	83/11/17
01050	LEAD	PB,SUSP	UG/L		23	21.7391	748.656	27.3616	1.25863	5.70528	99.0000	.000000	73/10/30	82/07/21
				K	12	97.0833	4.45454	2.11058	.021740	.609272	100.000	92.0000	74/04/23	77/10/20
				TOT	35	47.5714	1802.49	42.4567	.892463	7.17633	100.000	.000000	73/10/30	82/07/21
01051	LEAD	PB,TOT	UG/L		40	17.1750	1076.86	32.8156	1.91066	5.18860	200.000	.000000	70/11/30	82/07/21
				K	16	200.000	.000000	.000000		.000000	200.000	200.000	73/04/23	77/10/20
				TOT	56	69.4107	7709.05	87.8012	1.26495	11.7329	200.000	.000000	70/11/30	82/07/21
01054	MANGNESE	MN,SUSP	UG/L		35	33.0286	950.088	30.8235	.933238	5.21012	100.000	.000000	73/10/30	82/07/21
01055	MANGNESE	MN	UG/L		37	66.2162	4590.84	67.7558	1.02325	11.1390	400.000	10.0000	73/01/31	82/07/21
				K	2	10.0000	.000000	.000000		.000000	10.0000	10.0000	76/07/06	79/07/30
				TOT	39	63.3333	4507.02	67.1343	1.06002	10.7501	400.000	10.0000	73/01/31	82/07/21
01056	MANGNESE	MN,DISS	UG/L		36	33.2500	2710.88	52.0661	1.56590	8.67768	300.000	1.00000	73/04/23	83/11/17
				K	8	8.87500	10.1250	3.18198	.358533	1.12500	10.0000	1.00000	73/01/31	78/08/01

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01056	MANGNESE	MN,DISS	UG/L	TOT	44	28.8182	2298.62	47.9439	1.66367	7.22781	300.000	1.00000	73/01/31	83/11/17
01060	MOLY	MO,DISS	UG/L	K	5	10.0000	.000000	.000000		.000000	10.0000	10.0000	82/10/27	83/11/17
01065	NICKEL	NI,DISS	UG/L		14	1.50000	1.65385	1.28602	.857349	.343704	4.00000	.000000	69/02/02	83/11/17
				K	4	1.00000	.000000	.000000		.000000	1.00000	1.00000	81/10/20	83/01/21
				TOT	18	1.38889	1.31046	1.14475	.824223	.269821	4.00000	.000000	69/02/02	83/11/17
01066	NICKEL	NI,SUSP	UG/L		10	3.80000	19.2889	4.39191	1.15577	1.38884	15.0000	.000000	79/10/10	82/05/19
01067	NICKEL	NI,TOTAL	UG/L		12	4.91667	24.4470	4.94439	1.00564	1.42732	19.0000	.000000	79/10/10	82/07/21
01075	SILVER	AG,DISS	UG/L		8	.125000	.125000	.353553	2.82843	.125000	1.00000	.000000	79/10/10	81/07/21
				K	9	1.00000	.000000	.000000		.000000	1.00000	1.00000	81/10/20	83/11/17
				U	8	.000000	.000000	.000000		.000000	.000000	.000000	77/10/20	79/07/30
				TOT	25	.400000	.250000	.500000	1.25000	.100000	1.00000	.000000	77/10/20	83/11/17
01076	SILVER	AG,SUSP	UG/L		16	.187500	.162500	.403113	2.14993	.100778	1.00000	.000000	78/01/02	81/10/20
				K	1	10.0000					10.0000	10.0000	77/10/20	77/10/20
				TOT	17	.764706	5.81618	2.41168	3.15373	.584917	10.0000	.000000	77/10/20	81/10/20
01077	SILVER	AG,TOT	UG/L		11	.363636	.454546	.674200	1.85405	.203279	2.00000	.000000	79/10/10	81/07/21
				K	7	4.00000	50.0000	7.07107	1.76777	2.67261	20.0000	1.00000	77/10/20	82/07/21
				U	5	.000000	.000000	.000000		.000000	.000000	.000000	78/04/06	79/07/30
				TOT	23	1.39130	16.9763	4.12023	2.96141	.859127	20.0000	.000000	77/10/20	82/07/21
01080	STRONTIUM	SR,DISS	UG/L		8	46.0000	611.999	24.7386	.537796	8.74642	70.0000	.000000	68/02/25	83/11/17
01082	STRONTIUM	SR,TOT	UG/L		18	93.8888	15225.1	123.390	1.31422	29.0833	530.000	.000000	70/11/30	71/09/06
01085	VANADIUM	V,DISS	UG/L	K	5	6.00000	.000000	.000000		.000000	6.00000	6.00000	82/10/27	83/11/17
01090	ZINC	ZN,DISS	UG/L		79	110.379	10312.5	101.551	.920018	11.4253	420.000	.000000	61/11/22	83/11/17
				K	4	11.7500	90.9167	9.53502	.811491	4.76751	20.0000	3.00000	77/10/20	81/10/20
				TOT	83	105.626	10264.5	101.314	.959176	11.1206	420.000	.000000	61/11/22	83/11/17
01091	ZINC	ZN,SUSP	UG/L		34	48.5294	7279.59	85.3205	1.75812	14.6323	510.000	.000000	73/10/30	82/07/21
01092	ZINC	ZN,TOT	UG/L		57	143.035	17070.1	130.652	.913431	17.3053	820.000	30.0000	70/11/30	82/07/21
01106	ALUMINUM	AL,DISS	UG/L		2	35.0000	1250.00	35.3553	1.01015	25.0000	60.0000	10.0000	83/01/21	83/05/19
				K	3	10.0000	.000000	.000000		.000000	10.0000	10.0000	82/10/27	83/11/17
				TOT	5	20.0000	500.000	22.3607	1.11803	10.0000	60.0000	10.0000	82/10/27	83/11/17
01130	LITHIUM	LI,DISS	UG/L		7	7.57143	42.9524	6.55381	.865597	2.47711	16.0000	.000000	68/02/25	83/11/17
				K	1	4.00000					4.00000	4.00000	83/09/21	83/09/21
				TOT	8	7.12500	38.4107	6.19764	.869844	2.19120	16.0000	.000000	68/02/25	83/11/17
01132	LITHIUM	LI,TOT	UG/L		18	3.44444	32.3790	5.69025	1.65201	1.34121	20.0000	.000000	70/11/30	71/09/06
01145	SELENIUM	SE,DISS	UG/L		12	.999999	2.36363	1.53741	1.53741	.443812	4.00000	.000000	73/04/23	81/07/21
				K	32	1.00000	.000000	.000000		.000000	1.00000	1.00000	73/01/31	83/11/17
				TOT	44	1.000000	.604651	.777593	.777594	.117227	4.00000	.000000	73/01/31	83/11/17
01146	SELENIUM	SE,SUSP	UG/L		32	.187500	.608871	.780302	4.16161	.137939	4.00000	.000000	73/10/30	81/10/20
01147	SELENIUM	SE,TOT	UG/L		14	1.57143	4.72527	2.17377	1.38331	.580964	7.00000	.000000	73/01/31	81/07/21
				K	25	1.00000	.000000	.000000		.000000	1.00000	1.00000	74/07/25	82/07/21
				TOT	39	1.20513	1.69366	1.30141	1.07989	.208392	7.00000	.000000	73/01/31	82/07/21
01515	ALPHA-D	AS U-NAT	PC/L		10	.910000	.574334	.757848	.832800	.239653	2.90000	.200000	71/11/02	83/05/19

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01515 ALPHA-D	AS U-NAT	PC/L	K	5	.400000	.160000	.400000	1.00000	.178885	1.10000	.100000	72/04/03	80/05/12
			TOT	15	.740000	.476857	.690549	.933174	.178299	2.90000	.100000	71/11/02	83/05/19
01516 ALPHA-S	AS U-NAT	PC/L		6	.566666	.138667	.372380	.657141	.152023	1.20000	.200000	72/02/22	83/05/19
			K	10	.180000	.010667	.103280	.573778	.032660	.300000	.100000	71/11/02	80/10/21
			TOT	16	.325000	.090000	.300000	.923077	.075000	1.20000	.100000	71/11/02	83/05/19
03515 BETA-D	AS CS137	PC/L		38	2.09210	.303469	.550880	.263315	.089365	3.00000	.700000	71/11/02	83/09/21
03516 BETA-S	AS CS137	PC/L		23	1.03043	.539489	.734499	.712807	.153154	2.60000	.400000	71/11/02	83/09/21
			K	15	.400000	.204E-06	.000452	.001130	.000117	.400000	.400000	71/11/29	82/05/19
			TOT	38	.781577	.418301	.646762	.827508	.104919	2.60000	.400000	71/11/02	83/09/21
09510 RA-226-D	PLCHT CT	PC/L	K	1	.100000					.100000	.100000	72/10/02	72/10/02
09511 RA-226-D	RADON MT	PC/L		37	.039189	.000247	.017221	.439429	.002831	.090000	.020000	71/11/02	83/09/21
22703 U-NAT	DISOLVED	UG/L		7	1.10000	.076667	.276888	.251716	.104654	1.50000	.700000	71/11/29	83/09/21
			K	1	.400000					.400000	.400000	78/05/22	78/05/22
			TOT	8	1.01250	.126966	.356323	.351924	.125979	1.60000	.400000	71/11/29	83/09/21
31501 TOT COLI	MFIMENDO	/100ML		93	768.213	9237128	3039.26	3.95628	315.157	28000.0	.999999	70/11/30	77/07/13
			K	9	207.222	274541	523.967	2.52853	174.656	1600.00	.999999	71/03/14	77/03/23
			L	12	333.333	312170	558.721	2.39454	161.289	2000.00	20.0000	71/01/24	73/07/11
			TOT	114	667.620	7615558	2759.63	4.13353	258.463	28000.0	.999999	70/11/30	77/07/13
31507 TOT COLI	MPN COMP	/100ML		83	815.809	7080138	2660.85	3.26161	292.066	23000.0	.000000	62/10/24	70/09/20
31616 FEC COLI	MFM-FCBR	/100ML		34	51.4409	9492.77	97.4360	1.89413	16.7101	389.999	.000000	73/01/18	76/10/12
			B	2	175.000	50.0664	7.07576	.040433	5.00332	180.000	170.000	76/04/12	76/05/11
			K	8	.999998	.817E-06	.000904	.000904	.000320	.999999	.999999	73/02/28	76/08/30
			L	19	27.3684	98.2472	9.91197	.362168	2.27396	40.0000	20.0000	72/10/11	73/09/25
			TOT	63	41.6983	5984.17	77.3587	1.85520	9.74628	389.999	.000000	72/10/11	76/10/12
31625 FEC COLI	M-FCAGAD	/100 ML		37	9.99998	320.833	17.9118	1.79118	2.94468	86.0000	.999999	76/11/30	82/09/01
			B	4	86.9999	8931.34	94.5058	1.08627	47.2529	200.000	7.00000	78/04/06	80/03/12
			K	24	.999999	.000001	.001152	.001152	.000235	1.00000	.999999	76/11/03	82/01/19
			TOT	65	11.4154	998.025	31.5915	2.76746	3.91845	200.000	.999999	76/11/03	82/09/01
31673 FECSTREP	MFKFAGAR	/100ML		45	16.5777	2884.28	53.7055	3.44758	8.00594	360.000	.999999	73/01/31	82/09/01
			B	6	4775.00	.120E+09	10999.0	2.30346	4490.33	27200.0	2.00000	78/06/21	80/03/12
			K	18	1.11111	.104578	.323386	.291047	.076223	2.00000	.999999	73/02/28	81/10/20
			TOT	69	425.666	.107E+08	3274.97	7.69376	394.260	27200.0	.999999	73/01/31	82/09/01
31679 FECSTREP	MF M-ENT	/100ML		32	64.4372	18898.1	137.470	2.13340	24.3016	719.999	.999999	73/10/30	76/08/30
			K	5	.999998	.000001	.001092	.001092	.000488	.999999	.999999	74/07/25	76/10/12
			TOT	37	55.8646	16756.8	129.448	2.31717	21.2811	719.999	.999999	73/10/30	76/10/12
32226 CHL B	PERIPHTN	MG/M2		4	1.82500	5.40916	2.32576	1.27439	1.16288	5.20000	.100000	75/01/21	75/10/22
32228 CHL A	PERIPHTN	MG/M2		4	12.5000	417.153	20.4243	1.63395	10.2122	43.0000	.100000	75/01/21	75/10/22
39025 SIMAZINE	WTH ECM	UG/L	U	8	.000000	.000000	.000000		.000000	.000000	.000000	76/08/30	78/08/01
39034 PERTHANE	WHL SMPL	UG/L	K	2	.100000	.745E-08	.000086	.000863	.000061	.100000	.100000	82/03/23	82/06/02
39250 NAPTHAL	ENES, PC	UG/L	K	2	.100000	.745E-08	.000086	.000863	.000061	.100000	.100000	82/03/23	82/06/02
39251 PCNS	MUD	UG/KG	K	1	1.00000					1.00000	1.00000	82/06/02	82/06/02

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19330 ALDRIN		TOT UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
19333 ALDRIN	SEDUG/KG	DRY WGT	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
19340 GAMMABHC	LINDANE	TOT,UG/L		1	.010000					.010000	.010000	77/11/30	77/11/30
			K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.001250	.000011	.003378	2.70265	.000690	.010000	.000000	75/05/19	82/06/02
19343 GHHC-MUD	LINDANE	DRYUG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
19350 CHLRDANE	TECH&MET	TOT UG/L		1	.060000					.060000	.060000	80/05/12	80/05/12
			K	2	.100000	-.372E-08	.000000		.000000	.100000	.100000	82/03/23	82/06/02
			U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.010833	.000904	.030060	2.77480	.006136	.100000	.000000	75/05/19	82/06/02
19351 CDANEDRY	TECH&MET	MUDUG/KG	K	1	1.00000					1.00000	1.00000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.500000	.500000	.707107	1.41421	.500000	1.00000	.000000	78/05/02	82/06/02
19360 DDD	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
19363 DDD	MUD	UG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
19365 DDE	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
19368 DDE	MUD	UG/KG		1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
19370 DDT	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
19373 DDT	MUD	UG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
19380 DIELDRIN		TOTUG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02

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12433000 543106 54A070
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53063 WASHINGTON SPOKANE
130391

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112WRD 17010307000
0000 CLASS 00 CSN-RSP 0016510-0287010

INDEX 1310001 006500
MILES 0643.00 0033.30

PARAMETER			RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
39383 DIELDRIN	SEDUG/KG	DRY WGT	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
39388 ENDOSULN	WHL SMPL	UG/L	K	2	.010000	-.145E-10	.000000		.000000	.010000	.010000	82/03/23	82/06/02
39389 ENDOSULN	MUD	UG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
39390 ENDRIN		TOT UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
39393 ENDRIN	SEDUG/KG	DRY WGT	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
39398 ETHION	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
			U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39399 ETHION	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39400 TOXAPHEN		TOTUG/L	K	2	1.00000	.000000	.000000		.000000	1.00000	1.00000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.083333	.079710	.282330	3.38796	.057630	1.00000	.000000	75/05/19	82/06/02
39403 TOXAPHEN	SEDUG/KG	DRY WGT	K	1	10.0000					10.0000	10.0000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	5.00000	50.0000	7.07107	1.41421	5.00000	10.0000	.000000	78/05/02	82/06/02
39410 HEPTCHLR		TOTUG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
39413 HEPTCHLR	SEDUG/KG	DRY WGT	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
39420 HPCHLREP		TOTUG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
39423 HPCHLREP	SEDUG/KG	DRY WGT	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
39480 MTHXYCLR	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
			U	22	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	24	.000833	.000008	.002823	3.38796	.000576	.010000	.000000	75/05/19	82/06/02
39481 MTHXYCLR	MUD DRY	UG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
			U	1	.000000					.000000	.000000	78/05/02	78/05/02
			TOT	2	.050000	.005000	.070711	1.41421	.050000	.100000	.000000	78/05/02	82/06/02
39504 PCB-1254		TOTUG/L		1	.220000					.220000	.220000	78/02/07	78/02/07
39516 PCBS	WHL SMPL	UG/L	K	2	.100000	-.372E-08	.000000		.000000	.100000	.100000	82/03/23	82/06/02

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INDEX 1310001 006500
MILES 0643.00 0033.30

PARAMETER				RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
39516	PCBS	WHL SMPL	UG/L	U	11	.000000	.000000	.000000		.000000	.000000	.000000	77/11/30	80/08/20
				TOT	13	.015385	.001410	.037553	2.44097	.010415	.100000	.000000	77/11/30	82/06/02
39519	PCBS	MUD	UG/KG	K	1	1.00000					1.00000	1.00000	82/06/02	82/06/02
				U	1	.000000					.000000	.000000	78/05/02	78/05/02
				TOT	2	.500000	.500000	.707107	1.41421	.500000	1.00000	.000000	78/05/02	82/06/02
39530	MALATHN	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
				U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
				TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39531	MALATHN	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39540	PARATHN	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
				U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
				TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39541	PARATHN	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39570	DIAZINON	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
				U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
				TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39571	DIAZINON	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39600	MPARATHN	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
				U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
				TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39601	MPARATHN	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39630	ATRAZINE	WHL SMPL	UG/L	U	11	.000000	.000000	.000000		.000000	.000000	.000000	75/12/22	78/08/01
39730	2,4-D	WHL SMPL	UG/L		1	.040000					.040000	.040000	82/06/02	82/06/02
				K	1	.010000					.010000	.010000	82/03/23	82/03/23
				U	13	.000000	.000000	.000000		.000000	.000000	.000000	75/12/22	79/11/14
				TOT	15	.003333	.000110	.010465	3.13961	.002702	.040000	.000000	75/12/22	82/06/02
39731	2,4-D	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39740	2,4,5-T	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
				U	13	.000000	.000000	.000000		.000000	.000000	.000000	75/12/22	79/11/14
				TOT	15	.001333	.000012	.003519	2.63899	.000909	.004000	.000000	75/12/22	82/06/02
39741	2,4,5-T	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39755	MIREX	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
39758	MIREX	BOT MAT	UG/KG	K	1	.100000					.100000	.100000	82/06/02	82/06/02
39760	SILVEX	WHL SMPL	UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/02
				U	13	.000000	.000000	.000000		.000000	.000000	.000000	75/12/22	79/11/14
				TOT	15	.001333	.000012	.003519	2.63899	.000909	.010000	.000000	75/12/22	82/06/02
39761	SILVEX	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
39786	TRITHION	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
				U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
				TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39787	TRITHION	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02

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PARAMETER			RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
39790 MTRTHION	WHL SMPL	UG/L	K	2	.010000	.727E-10	.000009	.000853	.000006	.010000	.010000	82/03/23	82/06/02
			U	21	.000000	.000000	.000000		.000000	.000000	.000000	75/05/19	80/08/20
			TOT	23	.000870	.000008	.002881	3.31320	.000601	.010000	.000000	75/05/19	82/06/02
39791 MTRTHION	MUD	UG/KG	U	1	.000000					.000000	.000000	78/05/02	78/05/02
60050 ALGAE	TOTAL	/ML		72	7074.39	.563E+08	7507.02	1.06115	884.711	36000.0	11.0000	73/11/27	81/09/16
70299 RES-SUSP	AT 180 C	MG/L		1	.000000					.000000	.000000	76/08/30	76/08/30
70300 RESIDUE	DISS-180	C MG/L		262	82.5034	512.318	22.6344	.274345	1.39836	133.000	41.0000	59/10/29	83/11/17
70301 DISS SOL	SUM	MG/L		129	80.5116	429.678	20.7287	.257462	1.82506	132.000	40.0000	60/07/28	83/03/22
70302 DISS SOL	TONS/DAY			199	1595.75	1255069	1120.30	.702050	79.4158	7420.00	64.2000	59/10/29	81/09/16
70303 DISS SOL	TONS PER	ACRE-FT		197	.111774	.000924	.030398	.271958	.002166	.180000	.060000	59/10/29	83/01/21
70331 SUSP-SED	PARTSIZE	%<.062MM		70	89.5128	235.662	15.3513	.171498	1.83483	100.0000	28.0000	73/12/17	80/03/12
70950 BIOMASS-	CHLRATIO	PERIUNIT		5	72.5480	7522.03	86.7296	1.19548	38.7867	188.000	.000000	79/07/30	80/10/21
70957 CHLRPHYL	A-PERIPH	CHFLUG/L		7	11.0914	170.653	13.0634	1.17779	4.93751	36.3000	.010000	78/05/02	80/10/21
70958 CHLRPHYL	B-PERIPH	CHFLUG/L		7	3.85286	12.1630	3.48765	.905186	1.31817	8.58001	.000000	78/05/02	80/10/21
71820 DENSITY		GM/ML		1	1.00000					1.00000	1.00000	69/02/02	69/02/02
71845 AMMONIA	TOT-NH4	MG/L		22	.057727	.002552	.050515	.875060	.010770	.160000	.000000	79/04/23	81/01/20
71846 AMMONIA	DISS-NH4	MG/L		33	.116969	.006466	.080409	.687435	.013997	.400000	.000000	79/10/10	83/03/22
71851 NITRATE	DISS-NO3	MG/L		150	1.70533	.675780	.822058	.482052	.067121	3.90000	.200000	59/10/29	81/07/21
71856 NITRITE	DISS-NO2	MG/L		4	.060000	.000400	.020000	.333333	.010000	.070000	.030000	72/07/12	81/07/21
71885 IRON	FE	UG/L		10	112.000	8462.25	91.9905	.821343	29.0899	300.000	20.0000	62/10/24	65/09/25
71886 TOTAL P	AS PO4	MG/L		42	.118095	.015035	.122618	1.03630	.018920	.640001	.000000	79/04/23	83/11/17
71887 TOTAL N	AS NO3	MG/L		90	4.66219	5.78665	2.40555	.515969	.253567	17.0000	1.20000	73/10/30	81/09/16
71890 MERCURY	HG,DISS	UG/L		15	.200000	.090000	.300000	1.50000	.077460	1.10000	.000000	79/10/10	83/11/17
			K	29	.362069	.037438	.193490	.534401	.035930	.500000	.100000	73/01/31	83/05/19
			TOT	44	.306818	.059720	.244376	.796486	.036841	1.10000	.000000	73/01/31	83/11/17
71895 MERCURY	HG,SUSP	UG/L		35	.154286	.153143	.391335	2.53643	.066148	2.00000	.000000	73/10/30	82/07/21
71900 MERCURY	HG,TOTAL	UG/L		55	.529087	.658026	.811188	1.53318	.109381	4.10000	.000000	70/11/30	82/07/21
			K	22	.390909	.033247	.182337	.466443	.038874	.500000	.100000	73/01/31	79/07/30
			TOT	77	.489607	.480679	.693310	1.41605	.079010	4.10000	.000000	70/11/30	82/07/21
80020 U-DISS.	EXT.FLR.	UG/L		30	.393999	.145176	.381020	.967058	.069564	1.20000	.020000	71/11/02	83/05/19
80030 ALPHA-D	AS U-NAT	UG/L		24	2.12500	1.51762	1.23192	.579728	.251464	4.90000	.600000	71/11/02	83/05/19
			K	14	.992857	1.01456	1.00725	1.01450	.269200	4.30000	.400000	72/04/03	83/09/21
			TOT	38	1.70789	1.60616	1.26734	.742051	.205590	4.90000	.400000	71/11/02	83/09/21
80040 ALPHA-S	AS U-NAT	UG/L		17	1.52941	1.94096	1.39318	.910931	.337897	4.80000	.400000	72/02/22	83/05/19
			K	21	.400000	.190E-06	.000437	.001092	.000095	.400000	.400000	71/11/02	83/09/21
			TOT	38	.905261	1.16321	1.07852	1.19140	.174960	4.80000	.400000	71/11/02	83/09/21
80050 BETA-D	AS SR-Y-	90, PC/L		37	1.70270	.150281	.387661	.227674	.063731	2.40000	.700000	71/11/02	83/09/21
80060 BETA-S	AS SR-Y-	90, PC/L		21	.957141	.377673	.614469	.641984	.134088	2.20000	.400000	71/11/02	83/09/21
			K	16	.400000	.127E-06	.000357	.000891	.000089	.400000	.400000	71/11/29	82/05/19
			TOT	37	.716215	.288061	.536715	.749378	.088235	2.20000	.400000	71/11/02	83/09/21
80154 SUSP SED	CONC	MG/L		117	8.88022	93.4511	9.66701	1.08860	.893715	51.9999	.999999	73/01/31	83/09/21

STORET RETRIEVAL DATE 84/06/18 - INVENT - VERSION OF SEP, 1981

RETRIEVAL FOR DICK PEARL

12433000 543106 54A070
47 50 18.0 117 51 05.0 2
SPOKANE RIVER AT LONG LAKE, WASH.
53063 WASHINGTON SPOKANE
130391

/TYPA/AMBNT/STREAM

112WRD 17010307000
0000 CLASS 00 CSN-RSP 0016510-0287010

INDEX 1310001 006500
MILES 0643.00 0033.30

PARAMETER			RMK	NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
80155 SUSP SED	DISCHARG	TONS/DAY		96	285.937	399107	631.749	2.20940	64.4776	5140.00	7.00000	73/10/30	81/09/1
81886 PERTHANE	SED DRY	MGTUG/KG	K	1	1.00000	—				1.00000	1.00000	82/06/02	82/06/0
82068 POTAS-40	K-40,DIS	PC/LITER		10	.870000	.042334	.205751	.236496	.065064	1.20000	.600000	80/10/21	81/07/2
82183 2,4-DP	DICLPHOP	TOT UG/L	K	2	.010000	.000000	.000000		.000000	.010000	.010000	82/03/23	82/06/0

APPENDIX G

POINT SOURCES OF AIR POLLUTION WITHIN 50 KM OF SPOKANE RESERVATION AND AREA SOURCES

POINT SOURCES WITHIN 50 KM OF SPOKANE RESERVATION BORDER
(Emissions in tons/year)

Source	Location	TSP	SO_2	NO_x	VOC	CO
Continental	Spokane				44	
Exxon	"				104	
Yellowstone Pipeline	"				5	
Yellowstone Pipeline	"				56	
Conoco	"				260	
Tosco Corp	"				388	
North Pacific Grain	"	10				
United Paving	"	76				
Central Premix	"	31				
WI Forest Products	"	33		150	39	30
Washington Water Power	"	4	16	200		5
Acme Concrete	"	61				
Inland Asphalt	"	32				
Inland Empire PEA	"	52				
Cenex Western Com	"	3				
Spokane Seed	"	19				
Centennial Mills	"	5				
Ralston Purina	"	77				
Inland Zinc Co	"	52				
Spokane Rock Products	"	24				
Morrison Bros Seed	Spokane	2				
Spokane Prestolog	"	30				
NW Sandblast Co	"	20				
Central Premix	"	63				
Spokane Concrete PR	"	2				
Spokane Steel Foundry	"	16				
Inland Asphalt	"	31				
Central Premix	"	58				
Fairchild Air Force Base	"	27		25	2	5
Kaiser Alum & Chem	"	948	6497	53	3	57604
Inland Foundry	"	1				
S & F	"	37				
Cheney Grain Grower	Cheney	7				
Rozzel Heating Pl	"	1	1	10	1	2
National Biscuit Co	"	40				
Hunters Timber	Hunters	30	4	30	40	468
Saramy Lumber	"	10				
Springdale Lumber	Springdale	25	22	2	24	285
Allied Mineral		75				
Ross Pallet Shop	Chewelah	25				
Manufacture Mineral	"	100				
Phoenix Res	"					
Recovery	"					

POINT SOURCES WITH 50 KM OF SPOKANE RESERVATION BORDER (Cont.)

Source	Location	TSP	SO_2	NO_x	VOC	CO
Northwest Marble	Chewelah	100				
Lake Mount Silica	Valley	20				
Nanome Aggregates	"	43				
Saramy Lumber	"	10				
Peak Paving Co Inc	Addy	1				
Northwest Alloys	"	299	656	67	6	25
Coulee Concrete	Coulee	19				

POINT SOURCE TOTALS

AREA IDENTIFICATION	TSP	SO_2	NO_x	VOC	CO
1 Coulle Concrete	19				
2 Cheney	48				
3 Spokane	1714	6513	428	901	57944
4 Hunters	40	4	36	40	468
5 Springdale	100	22	2	24	285
6 Valley	73				
7 Chewelah	253				
8 Addy	300	656	67	972	58724
TOTALS	2547	7196	543	972	58724

sources: State of Washington, Department of Ecology, Point Source Inventory - Short Form Run Date 2/6/84.

Coulee Concrete; Draft Environmental Impact Statement, Creston Generating Station, Table D-5, Washington State Air Monitoring Data for 1983, Washington State Department of Ecology, June 1984.

Phil Nelson, Washington State Department of Ecology, phone contact 2/28/85. Confirmation of Lincoln Divison of Crown Zellerbach no longer in operation.

note: Spokane point source totals include point sources from one of its suburbs; Mead.

AREA SOURCES

COUNTY	EMMISSIONS IN TONS/YEAR 1982				
Lincoln	1522	120	1397	1815	10617
Pend Orielle	481	62	591	937	5262
Spokane	17312	2597	17333	32163	173623
Okanogan	7325	335	3371	8088	47389
Ferry	559	66	449	826	3860
Stevens	1263	231	1827	2290	11263

Source: State of Washington, Department of Ecology, Summary of Air Contaminant Emissions/Four Counties, letter 3/21/84.

APPENDIX H
DISPERSION CALCULATIONS
FOR EXISTING AND PROPOSED
AIR POLLUTION SOURCES

DISPERSION CALCULATIONS

I. Wood Burning Stove and Fireplace Emissions

Emissions from wood burning in stoves and fireplaces were calculated from the following assumptions:

- five cords of wood per household burned per year,
- Ponderosa pine and Douglas fir are burned, and it has a density of 22.5 of lb/cubic foot as it is stacked,
- emissions are 42 lb particulate per ton of wood and carbon monoxide emissions are 6.2 times higher (EPA AP-42), and
- there are 431 occupied houses on the reservation (Spokane Housing Dept., 1985).

Ep (tons per year)=431 houses x 5 cords per house x 128 cubic feet per cord x 22.5 lb per cubic foot x 42 lb particulate per ton/2000 lb

Ep=65 tons per year particulates
Eco=404 tons per year carbon monoxide

The wood burning is concentrated in the wintertime. Assuming the burning is over a four-month period at an even rate (worst case), the emissions are 1086 lb particulate and 6734 lb carbon monoxide per day. The Wellpinit area has the highest density of housing on the reservation. It is assumed that in this area of two square miles there are one-fourth of the houses (Spokane Housing Dept., 1985) or 108 houses. On a winter day with no wind the mixing height is at tree top which is about 20 meters. Calm stable conditions can exist for most of the night which can be up to 15 hours. There will be some movement of the air in this 15-hour period. If the pollutants remain in this 2 square mile area for a 12-hour period before being diluted and there is clean air, the remainder of the day, the 24-hour average concentration would be 161 ug/m3. In the latter part of the 12-hour build-up period the carbon monoxide concentrations would be 2.6 mg/m3 as an eight-hour average.

II. Slash Burning

The Spokane Tribe estimates a burn of 600 acres of slash per year. This is done in 3 parcels. The National Forest Service suggests a fuel loading of 40 tons per acre for this area of Washington (Sandberg, 1985). At an emission rate of 21 grams of particulates per kilogram of fuel this prescribed burning will produce 504 tons of particulate per year. The papers by Ward, (1983) and McMahon, (1983) provide much greater detail on these emissions and efforts on visibility. These particulates are predominantly fine-sized and will remain in the atmosphere as if a gas and travel long distances downwind. There is no generally accepted means of estimating the impacts from this activity.

III. Feedlot

The hypothetical feedlot has a capacity of 1000 head of cattle (Spokane Tribe, 1985) and will be confined to an area of approximately 10 acres (40,000 square meters). Emissions from this type of activity are 280 lb/day particulates and 11 lb/day ammonia (AP-42). Emissions of other odorous gases are difficult to define. A

50% dropout rate for the particles was assumed in the modeling (an approximate average of dropout from paved and unpaved road activity AP-42, Section 11.2).

Impacts were estimated assuming the dust creating activity is uniformly spread over the day, the emission height is 5 meters (to account for surface mixing) the area is assumed to be square. This source was modeled using ISCST, two years of meteorological data, and a circle of receptors as a screening analysis. The five days causing maximum 24-hour impacts were used in the ISCST model with a more complete receptor grid.

IV. Mining

The size of operation of the Sherwood and Dawn Mines in the future is unknown so an estimate is made assuming a relatively large project, moving 2,000,000 to 4,000,000 million tons of ore and overburden per year. When initially permitted, the Sherwood Mine was designed to handle about 6,000,000 tons per year but recently was operating at a much reduced rate. From haul distances at Sherwood it is estimated that hauling of the material will require 200,000 miles of travel with an emission factor of 4 lb/mile, a value representing a well controlled haul road. Emissions from other activities such as material transfer and support vehicle activity on the haul roads is neglected as they are generally much less than the emissions from the material hauling. The area of activity is confined to about a one kilometer square. Fifty percent of the dust is assumed to settle immediately and be of no concern downwind. The plume height is assumed to be 5 meters (about the height of the wake from hauling machinery). This source was modeled using the five worst dispersion days from the feedlot analysis and modeled on a detailed grid with receptors at every 10 degrees and at radii of 2, 3, 5, and 10 kilometers.

V. Woodfired Boiler

A woodfired boiler is being considered for the Spokane Reservation because of the availability of wood scraps from saw milling and logging. The boiler is proposed for the Ford area of the reservation. Fuel supply is estimated from the assumptions that there will be 40 tons of slash per acre from the logging and thinning of up to 1400 acres per year of a total to 56,000 tons of wood per year. The sawmill will contribute an amount assumed to be 4000 tons per year for a total of 60,000 tons. The wood will be predominantly Ponderosa pine and Douglas Fir. If the wood is burned in a green condition, the moisture content will be on the order of 40% and the heat value will be about 6000 BTU per lb. The annual fuel supply will be 720,000 MBTU. Operating 24 hours per day and 250 day per year the daily heat input will be 120,000 MMBTU per day (10 tons of chips per day).

A boiler of this size will have a stack of 100 feet or more. One hundred feet is assumed. The temperature rise from ambient to stack exhaust will be approximately 100° C and flux approximately 36 cubic meters per second. Choosing an exit velocity of 12 meters per second determines a diameter of 1.95 meters. Emission factors are taken from AP-42 assuming a wood and bark mixture. Particulate emissions are estimated at 7.2 lb per ton of chips and carbon monoxide at 25 lb per ton of chips. This is equal to a boiler emission rate of 72 lb per hour particulates and 250 lb per hour carbon monoxide.

The ISCST dispersion model was run to estimate the impacts of the boiler. Only particulates were analyzed because the carbon monoxide emissions are very small and impacts of carbon monoxide will be very low compared with the standards. The boiler impacts were modeled with the two years of meteorological data and a receptor grid covering the northeast and southwest quadrants at radii of 500, 1000, 2000, 3000 and 5000 meters.

APPENDIX I
CENSUS DATA

JOHN SPELLMAN
Governor

KX TALLER
Director

STATE OF WASHINGTON
OFFICE OF FINANCIAL MANAGEMENT
Insurance Building, MS AQ-44 • Olympia, Washington 98504 • (206) 753-5450

October 23, 1984

Mr. Roger Herriot
Chief
Population Division
Bureau of the Census
Washington, D.C. 20233

Dear Mr. Herriot:

The Spokane Indian Tribe contracted for a state certified census of all persons residing on the Spokane Indian Reservation as of September 19, 1984. The count was conducted to allow the tabulation of total residents, total Indians according to the federal census definition, and total Indians according to the Office of Revenue Sharing definition.

A total of 1,494 residents was counted. Table I shows the population including 1,198 Indians, following the Bureau of Census definition.

TABLE I
POPULATION ON THE SPOKANE INDIAN RESERVATION
BUREAU OF THE CENSUS RACIAL DEFINITIONS
SEPTEMBER 19, 1984

TOTAL POPULATION	TRIBAL MEMBERS	OTHER INDIANS	SUBTOTAL INDIANS	NON-INDIANS
1,494	954	244	1,198	296

The Office of Revenue Sharing definition of Indian includes all family members in households of which the householder or spouse is Indian. Use of this definition increases the number of people categorized as Indian by 135, to 1,333 people. Table II sets forth the count following the ORS definition.

TABLE II
POPULATION ON THE SPOKANE INDIAN RESERVATION
OFFICE OF REVENUE SHARING RACIAL DEFINITIONS
SEPTEMBER 19, 1984

TOTAL POPULATION	INDIANS BUREAU OF THE CENSUS DEFINITION	OTHER FAMILY MEMBERS IN INDIAN HOUSEHOLD	SUBTOTAL ALL INDIANS ORS DEFINITION	NON-INDIANS
1,494	1,198	135	1,333	161

I certify these counts to be correct. If you have any questions, or require more detailed tabulations please let me know.

Sincerely,

Theresa J. Lowe
Chief Demographer

TL:lw

cc: Mr. Richard Irwin
Ms. Edna Paisano
Mr. Keith Debus
Dr. Marilyn McCurtin

APPENDIX J

NOTICE LETTERS

REDESIGNATION OF AIR OF SPOKANE INDIAN RESERVATION

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. John R. Spencer
Regional Administrator of EPA
M/S 601
1200 Sixth Avenue
Seattle, Washington 98101

Re: Redesignation of Air of Spokane Indian Reservation

Dear Mr. Spencer:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c).

The Spokane Tribe of Indians wishes, by this letter, to give the Environmental Protection Agency formal notice of its intent to redesignate the lands of the western part of the Reservation as Class I.

The Spokane Tribe of Indians is beginning immediately to fulfill the procedural requirements of the Clean Air Act. The Spokane Tribe expects to present this redesignation to the Administrator for final approval on or before January 31, 1984.

The Spokane Tribe of Indians plans to work in close cooperation with your office and will appreciate any assistance that you may give us.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Governor John Spellman
Office of the Governor
Legislative Building
Olympia, Washington 98504

Re: Redesignation of Air of Spokane Indian Reservation

Dear Governor Spellman:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin the process of redesignation of the lands of the west end of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 states that consultation with the State in which the Reservation is located is necessary. A formal notice to the State must be given thirty days prior to the public hearing.

The Spokane Tribe of Indians does not expect to have the formal hearing much before the end of 1983. However, to facilitate communication, we are giving notice to our intent in order that amicable communication can take place between the State and the Spokane Tribe of Indians, and furthermore that misunderstandings can be avoided.

It is the intent of the Spokane Tribe of Indians to keep the State informed as to its progress and will certainly be giving the required notices of the public hearing and information as to the required studies.

It would be greatly appreciated if you would contact all State agencies that need to know of our intent. Express to those agencies our willingness to communicate and work with them on this important step that the Spokane Tribe of Indians is taking.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Dave Matheson, Chairman
Coeur d'Alene Tribe of Indians
Coeur d'Alene Tribal Office
Plummer, Idaho 83851

Re: Redesignation of Air of West End of Spokane Indian Reservation

Dear Dave:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). By 40 CFR 52.21, the Spokane Tribe is to give notice to all affected Tribes.

The Environmental Protection Agency determines that all protected parties are those who live within 50 kilometers of the Spokane Indian Reservation. However, we wish to give notice to you because of the importance of this step that we are taking and possible feelings that the Coeur d'Alene Tribe might have regarding this matter.

Formal notice will be given to you towards the end of this year which will invite you to take part in the formal hearing on this matter. However, we are sending you this notice to enable you to begin communication on this matter as soon as you wish. It is our wish to sit down with your council to discuss this matter and the possible affects that it may have on your Reservation anytime that you wish. Obviously, since the redesignation will demand Washington industries to use the utmost diligence in cleaning up their emissions, it cannot help but be of benefit to the Coeur d'Alene Indian Tribe and the State of Idaho.

Please feel free to communicate with us anytime on this matter.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mathias David, Chairman
Kootenai Tribal Council
Kootenai Tribal Office
P.O. Box 1002
Bonners Ferry, Idaho 83805

Re: Redesignation of Air on Spokane Indian Reservation in the State of Washington

Dear Mathias:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). By the terms of 40 CFR 52.21, we are instructed to give notice to all Indian Tribes who may be affected by this redesignation. The Environmental Protection Agency has informed us that anyone within thirty-five miles probably has to be notified. However, since you are brothers and sisters, we feel it proper to give you notice even though you are well without the range of any effect.

We feel confident that you will agree with us that redesignation of our air to Class I will be of benefit to your Tribe, to your area, and to the State of Idaho. Class I air will necessitate Washington industries to use the highest degree of diligence in cleaning the emissions from their operations.

We wish to communicate with you on this matter. If you have any questions, communications, or comments about this matter, please do not hesitate to call, write, or visit.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Glen Nenema, Chairman
Kalispel Tribal Office
P.O. Box 38
Usk, Washington 99180

Re: Redesignation of Air on Spokane Indian Reservation

Dear Glen:

By now you probably are aware that on January 17, 1983, by Resolution, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c).

By terms of 40 CFR 52.21, the Spokane Tribe of Indians is to give notice to all parties that may be affected by this redesignation. Obviously, formal notice will be given before the final formal hearings on the matter. However, we are giving notice at this time so that a communication process can begin.

It is the wish of the Spokane Tribal Business Council to meet with the Kalispel Business Council regarding this matter at your wish and convenience. Furthermore, please feel free to communicate with us regarding this matter at anytime you wish.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Garrey E. Carruthers
Assistant Secretary Land
and Water Resources
Interior Building
Eighteenth and "C" Streets N.W.
Washington, D.C. 20240

Re: Redesignation of Air of Spokane Indian Reservation in the State of Washington

Dear Mr. Carruthers:

On January 17, 1983, the Spokane Tribal Business Council, the governing body of the Spokane Tribe of Indians, decided to begin the process of redesignation of the lands on the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 requires that the Spokane Tribe of Indians give formal notice to federal land managers whose lands may be affected by the proposed redesignation. Formal notice will not be necessary for purposes of the hearing until the end of 1983. However, the Spokane Tribe of Indians is giving this notice initially to open the process of meaningful communication on this matter.

The Spokane Tribe of Indians is most willing to communicate with you and any of your officers regarding this matter. It is the feeling of the Spokane Tribe of Indians that this proposed redesignation to Class I will be of benefit to the Bureau of Land Management. Please do not hesitate to begin communication of any type with us on this matter.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians
P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465
CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Charles T. Coston
Regional Forester
Northern Region
USDA Forest Service
Box 7669
Missoula, Montana 59807

Re: Redesignation of Air of Spokane Indian Reservation in the State of Washington

Dear Mr. Coston:

On January 17, 1983, the Spokane Tribal Business Council, the governing body of the Spokane Tribe of Indians, decided to begin the process of redesignation of the lands on the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 requires that the Spokane Tribe of Indians give formal notice to federal land managers whose lands may be affected by the proposed redesignation. Formal notice will not be necessary for purposes of the hearing until the end of 1983. However, the Spokane Tribe of Indians is giving this notice initially to open the process of meaningful communication on this matter.

The Spokane Tribe of Indians is most willing to communicate with you and any of your officers regarding this matter. It is the feeling of the Spokane Tribe of Indians that this proposed redesignation to Class I will be of benefit to the forests of the region. Please do not hesitate to begin any communication of any type with us on this matter.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Jeff M. Sirmon
Regional Forester
Pacific Northwest Region
USDA Forest Service
Box 3623
Portland, Oregon 97208

Re: Redesignation of Air of Spokane Indian Reservation
in the State of Washington

Dear Mr. Sirmon:

On January 17, 1983, the Spokane Tribal Business Council, the governing body of the Spokane Tribe of Indians, decided to begin the process of redesignation of the lands on the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 requires that the Spokane Tribe of Indians give formal notice to federal land managers whose lands may be affected by the proposed redesignation. Formal notice will not be necessary for purposes of the hearing until the end of 1983. However, the Spokane Tribe of Indians is giving this notice initially to open the process of meaningful communication on this matter.

The Spokane Tribe of Indians is most willing to communicate with you and any of your officers regarding this matter. It is the feeling of the Spokane Tribe of Indians that this proposed redesignation to Class I will be of benefit to the forests of the region. Please do not hesitate to begin any communication of any type with us on this matter.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians
P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465
CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Governor John V. Evans
Office of the Governor
State House
Boise, Idaho 83720

Re: Redesignation of Air of Spokane Indian Reservation

Dear Governor Evans:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 states that we are to give notice to states that may be affected by the proposed redesignation.

The Tribe will be giving the formal notice as required by the regulations thirty days prior to the public hearing. However, the reason for this letter is to begin early communication on this redesignation so that meaningful communication may take place and avoidable difficulties do not arise.

The Spokane Tribe of Indians cannot help but feel that any impact to the State of Idaho would be beneficial inasmuch as a Class I designation would insure a cleaner environment for your state.

Would you please notify all agencies of the State of Idaho that would need to know of this initiation of redesignation process by the Spokane Tribe of Indians. Please communicate to these agencies our desire to communicate meaningfully with them to work for a successful conclusion to this redesignation.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Al Aubertin, Chairman
Colville Tribal Council
Colville Tribal Office
Nespelem, Washington 99155

Re: Redesignation of Air on West End of
Spokane Indian Reservation

Dear Al:

By Resolution dated January 17, 1983, the Spokane Tribal Business Council decided to begin redesignation of the lands of the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c).

By terms of 40 CFR 52.21, the Spokane Tribe of Indians is to give formal notice to all affected Indian Tribes. Communication on this matter has previously taken place. A meeting has been scheduled on this matter between the two Tribal Councils. The reason for this letter is to set into writing our formal notification to you regarding this redesignation, and to invite you to begin a communication process with us on this matter.

Formal notice will be given to you regarding the hearing, but this will be only after some months, probably around the end of 1983. We invite you to communicate with us in any way regarding this matter. It is our belief that this redesignation will benefit the lands of your Reservation inasmuch as Washington industry will necessarily have to use the utmost diligence in monitoring their emissions.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

Spokane Tribe of Indians

P. O. Box 385 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

February 3, 1983

Mr. Ray G. Arnett
Assistant Secretary for
Fish, Wild Life and Parks
Interior Building
Eighteenth and "C" Street N.W.
Washington, D.C. 20240

Re: Redesignation of Air of Spokane Indian Reservation in the State of Washington

Dear Mr. Arnett:

On January 17, 1983, the Spokane Tribal Business Council, the governing body of the Spokane Tribe of Indians, decided to begin the process of redesignation of the lands on the west side of our Reservation as Class I under the Clean Air Act, 42 USC, Section 7474(c). 40 CFR 52.21 requires that the Spokane Tribe of Indians give formal notice to federal land managers whose lands may be affected by the proposed redesignation. Formal notice will not be necessary for purposes of the hearing until the end of 1983. However, the Spokane Tribe of Indians is giving this notice initially to open the process of meaningful communication on this matter.

The Spokane Tribe of Indians is most willing to communicate with you and any of your officers regarding this matter. It is the feeling of the Spokane Tribe of Indians that this proposed redesignation to Class I will be of benefit to the National Park Service. Please do not hesitate to begin communication of any type with us on this matter.

Sincerely yours,

James W. Hill

James W. Hill, Vice Chairman
Spokane Tribal Business Council

APPENDIX K

EPA Region 10 Comments
To Draft

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

JAN 31 1986

REPLY TO ATTN OF: M/S 532

Lawrence Goodrow
Spokane Tribe of Indians
P. O. Box 100
Wellpinit, WA 99040

Dear Mr. Goodrow:

Thank you for the opportunity to review the draft "Spokane Tribe of Indians Air Quality Redesignation Document." We feel that this is a very commendable effort and is nearly ready for release for public review and comment. We do, however, have two concerns which we feel should be addressed, either before release or during the public review period.

First, we are concerned with the air quality dispersion modeling for the Washington Water Power facility which was performed by the Council of Energy Resource Tribes. The results of the EPA Valley model obtained by CERT should not have differed significantly from those obtained by TERA/TWWPCo for the PSD permit. Also, the Washington Water Power meteorological data is available from EPA and, as such, the Complex I model should have been used instead of the Valley model. We strongly suggest that CERT staff contact Rob Wilson of our Environmental Services Division (telephone 206-442-1531) in order to discuss the need for a revised modeling analysis.

Second, a cursory review of the entire document reveals little, if any, discussion of the "health, environmental, economic, social, and energy" effects on areas outside the Reservation which may be affected by the proposed redesignation. The document appears to concentrate solely upon the effects within the Reservation. The document should be supplemented with a discussion of off-reservation effects of the proposed redesignation.

We have also enclosed some specific comments on the draft report for your consideration.

As we have previously indicated, we will perform a more comprehensive review of the redesignation document during the public comment period. However, if you have any questions on our current concerns or comments, please contact David Bray at (206) 442-4253.

Enclosure

Sincerely,

George A. Abel

George A. Abel, Chief
Air Programs Branch

REGION 10 EPA COMMENTS ON DRAFT
SPOKANE TRIBE OF INDIANS
AIR QUALITY REDESIGNATION DOCUMENT

1. Page 1, Section 1.1 - The document should cite the current PSD regulations for redesignations (40 CFR 52.21(g)) which were promulgated on August 7, 1980.

2. Page 25, Section 3.2.3 - In the second paragraph, the fourth sentence should read "All pollutants monitored were below ambient air quality standards." (Not "levels".)

3. Page 31, Section 3.2.3 - Visibility data from the Spokane and Seattle airports are likely not representative of that on the Spokane reservation. Visibility data collected on Johnny George Mountain in the Colville Indian Reservation as part of the tri-state PANORAMAS study would better represent that on the Spokane Reservation. You should contact Mark Hooper of EPA at (206) 442-1949 to obtain access to that data.

4. Page 72, Section 4.1 - The last sentence in this section should be revised to state "EPA promulgated these new regulations on August 7, 1980."

5. Page 72, Section 4.2 - The last sentence in the first paragraph is incorrect. The concentration levels of the PSD increments cannot be directly compared to those of the national ambient air quality standards. Rather, the PSD increments limit the increase in air pollution above a baseline concentration. However, the increments may allow increases up to the level of the ambient standards. This sentence should be revised to read "PSD increments may limit air pollution to levels which are much lower than those set to protect human health (i.e. NAAQS)."

6. Pages 73 and 74, Section 4.3 - The discussion of increments is technically incorrect. The correct term is "increments," not "standards". As such, the sentence "The concept of these standards is increments." is redundant and should be deleted, and the term "standard" must be replaced by "increment" where appropriate.

7. Page 76, Section 4.5 - The first sentence should be revised to state "The PSD program is administered under the auspices of the EPA through a permit system and state implementation plans." The PSD program embodies more than just permits for new and modified major stationary sources per Section 165 of the Clean Air Act.

8. Page 76 and 77, Section 4.5 and Table 4.2 - Fugitive emissions and mining operations are not exempt from PSD requirements. The recent revisions to the PSD regulations (49 FR 43202, October 26, 1984) clearly indicate that fugitive emissions from mining operations are counted against the NAAQS and PSD increments. Furthermore, the mining operation could be subject to PSD permitting requirements if there are non-fugitive emissions associated with the operation. Finally, EPA has proposed to make surface coal mining operations directly subject to PSD permitting requirements based on their fugitive emissions (see 49 FR 43211, October 26, 1984).

9. Page 76, Section 4.5 - In paragraph 2, the citation should read "Table 4.2" not "Table 4.3."

10. Page 77, Section 4.5 - The final sentence should be revised to read "...after the increment is used up, no more sources, regardless of their merit, are allowed if they would further degrade air quality, and..."

11. Page 77, Table 4.2 - The title of this table should be revised to read "Table 4.2 SUMMARY OF PSD PERMIT REGULATIONS."

12. Page 77, Table 4.2 - The last sentence under the entry for "Applicability" should read "However, sources located in non-attainment areas are exempt from the above for the nonattainment pollutant".

13. Page 81, Section 5.1 - As indicated in comment #8 above, increases in all emissions, including fugitive dust emissions from feedlots, are counted towards increment consumption and therefore, may cause a violation of Class I or II PSD increments. (However, it is unlikely that a feedlot would be subject to PSD permit requirements.) The analysis must be revised to discuss the impact of a Class I redesignation upon the future of the feedlot.

14. Page 84, Section 5.5 - In the last sentence of the first paragraph, the word "of" should be changed to "or."

15. Page 104, Table 7-6 - The primary and secondary ambient standards for ozone are 0.12 parts per million which translates to 235 ug/m^3, not 240 ug/m^3. Also, EPA revoked the hydrocarbon standards several years ago, so it should be deleted from this table.

16. Page 125, Section 7.2.3 - As indicated in comment #3 above, visibility data from the site on Johnny George Mountain should be used for the background visual range in the Level-1 visibility modeling analysis.

REGION 10 EPA COMMENTS ON DRAFT
SPOKANE TRIBE OF INDIANS
AIR QUALITY REDESIGNATION DOCUMENT

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APPENDIX L

Spokane Tribe Response to EPA Comments

Spokane Tribe Response to EPA Comments

1. Citing made a suggested.

2. Correction made as suggested.

3. The results of CERT air quality modeling using the EPA Valley model are different than those used by TERA/TWWPCo for the 24 hour and annual SO_2 concentrations. This difference accurred because of a difference in assumption concerning the elevation of the most sensitive receptor, Johnny George Mountain. CERT used the top elevation of 4090 ft. and TERA used an elevation of 3550 ft. The use of the lower elevation by EPA and by CERT would result in a conclusion that even less capacity under PSD class I would be allowed than was found in the CERT document.

4. Correction made as suggested.

5. Correction made.

6. Correction made.

7. Correction made.

8. Issue clarified.

9. Correction made.

10. Correction made.

11. Correction made.

12. Correction made.

13. Issue clarified.

14. Correction made.

15. Item deleted.

16. Issue clarified.

The issue raised concerning Complex One Modeling:

In regard to the comment of EPA on the use of Complex One the following comments are made. In 1983 when CERT was requesting data from EPA to perform modeling, EPA advised CERT to obtain the meteorlogical data from TWWPCo. A request was made, but the data were not sent to CERT in a timely manner. The modeling performed at the time reflected the best available data and model. Later in 1984 after the initial study was completed TWWPCo. made the meteorlogical data available to CERT. In order to check all modeling results, the Complex One model should be used with updated TWWPCo. data.

However, it should be recognized that there does not exist any fundamental difference in results from the modeling performed by CERT and that used by TWWPCo. in their PSD permit application. The conclusions reached in the CERT document concerning the construction and operation of the Creston Generating Station remain that, at best, only one unit at 570 MWe could be operated under PSD Class I compliance.

Within section 9.0 the Tribe delineates impacts on that area outside the boundaries of the Reservation.

SPOKANE TRIBE OF INDIANS
AIR QUALITY
REDESIGNATION DOCUMENT

1881-198

Spokane Reservation
P.O. Box 100
WELLPINIT, WASHINGTON 99040
(509) 258-4581

SPOKANE TRIBE OF INDIANS
AIR QUALITY
REDESIGNATION DOCUMENT

December 13, 1985
Spokane Reservation
P.O. Box 100
WELLPINIT, WASHINGTON 99040
(509) 258-4581

SPOKANE TRIBE OF INDIANS
NOTICE OF PROPOSED REDESIGNATION AND HEARINGS

NOTICE IS HEREBY GIVEN that by Resolution dated January 17, 1983, the Spokane Tribe gave the Environmental Protection Agency formal notice of its intent to redesignate the Spokane Reservation as Class I under the Clean Air Act, 42 USC § 7474(c). As required by the Act, a Redesignation Document discussing the health, environmental, social and energy effects of the redesignation has been prepared and is available for public review and inspection at the Tribal building at Wellpinit, Washington, during the regular office hours of 8:00 a.m. to 4:00 p.m.

Public hearings on the redesignation shall be held at the following dates and places:

10:00 a.m. on September 10, 1986, at the
Tribal Building at Wellpinit, Washington.

7:00 p.m. on September 10, 1986, at the
Tribal Bingo Hall two miles south of Chewelah
on Highway 395.

At these hearings, the Spokane Tribal Business Council will be taking testimony in order to decide finally whether to redesignate the air over the Spokane Reservation. Each party will be allotted fifteen minutes of testimony time. More time can be requested by submitting a request in writing fourteen days before the hearings.

You are encouraged to submit all of your testimony in writing, especially if the information to be submitted is of an expansive or complex nature. This will give the Business Council and staff sufficient opportunity to study your testimony in detail. If parties do not wish to appear personally, but wish to submit written testimony, this testimony can be sent to:

Spokane Tribal Business Council
Class I Air
P.O. Box 100
Wellpinit, WA 99040

All written testimony must be submitted no later than September 10, 1986. Ample time has been accorded all parties in order to prepare such written testimony, so no extensions of time will be granted.

Spokane Tribe of Indians

P.O. Box 100 — Wellpinit, WA 99040 — Ph. (509) 258-4581/838-3465

CENTURY OF SURVIVAL
1881 - 1981

RESOLUTION

Spokane Resolution 1986-157

WHEREAS, throughout history the Spokane Tribal Community has withstood the continuous assault by individuals and groups who have sought the exploitation and degradation of their environment and culture; and

WHEREAS, through litigation and negotiation the tribe has and will continue to protect and preserve the living cycle of the Spokane people; and

WHEREAS, air quality is an important cultural, as well as economic value to the Spokane Tribe, maintaining its pristine quality enhances the quality of life, including the health of residents, scenic beauty of the area, vegetation species of cultural significance and the economic development of the area; and

WHEREAS, all of these require the preservation of the existing clean air quality on the reservation; and

WHEREAS, under the Clean Air Act Amendments of 1977, the Tribal Council has the authority to redesignate the classification of air quality on the Spokane reservation; and

WHEREAS, it is inherent in the tribal sovereignty of tribes that decisions concerning tribal environmental resources be made by the tribe and this right must not be infringed; and

WHEREAS, it is the policy of the United States Government and specifically that of the Environmental Protection Agency to look to tribal governments to play an enhanced role in decision-making and program management affecting reservation environments; and

WHEREAS, President Reagan affirmed in his Indian Policy statement of January 24, 1983 that tribes have a right to determine the best way to meet the needs of their members and to establish and operate programs which best meet those needs; and

WHEREAS, the Spokane Tribal council has been diligent in its efforts to develop environmental policies protecting the life ways of the Spokane Tribal Community; and

WHEREAS, the Federal Prevention of Significant Deterioration (PSD) Program presents the tribe with most clearly defined option for air quality resource management. To this end the tribe has accomplished the following:

1) An environmental baseline assessment was performed for the tribe to establish existing environmental and socioeconomic conditions on the reservation. Soils, water quality and quantity, vegetation, socioeconomics and air quality were evaluated.

2) An air quality dispersion model was performed.

NOW THEREFORE BE IT RESOLVED, that the Spokane Tribal Council does hereby assert its authority to proceed with the redesignation of air quality standards within the exterior boundaries of the Spokane Reservation; such a determination of a Class One Designation necessitates the tribe request the following assistance from the Environmental Protection Agency:

1) To determine the current air quality conditions on the reservation it is imperative that a complete meteorological and ambient air quality monitoring program be initiated. This is significant to the completion of a report describing and analyzing the health, environmental economic, social and energy effects of redesignation.

BE IT FURTHER RESOLVED, that the Spokane Tribal council does hereby notify all cognizant agencies, municipalities, and interested organizations of its intent to seek a redesignation for Class One Air quality within the external boundaries of the Spokane Indian Reservation; and

BE IT FURTHER RESOLVED, that the Spokane Tribal Council desires and request the impart of all interested parties pursuant making their final decision as it pertains to a Class I air quality redesignation for the Spokane Indian Reservation.

CERTIFICATION

The foregoing was duly enacted by the Spokane Tribal Business Council on the 27th day of March , 1986 by a vote of 3 for and 0 against under authority contained in Article VIII of the Spokane Indians ratified by the Spokane Tribe on November, 1980.

For Joe V. Flett, Chairman
Spokane Tribal Council

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EPA Region 10 Comments to Draft

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Spokane Tribe response to Comments

ACKNOWLEDGEMENTS

The Spokane Tribal Business Council wishes to acknowledge the contribution of the Council of Energy Resource Tribes staff and associates:

William Aubule
John Blueyes
Glen Lane
Warner Reeser
Rodger Steen

Much of this document was excerpted from two air quality studies prepared on behalf of the Spokane Tribe. We would also acknowledge tribal staff assistance in final preparation:

Lawrence Goodrow
Myrna Wynne
Marlene Peone

TABLES

FIGURES

SPOKANE TRIBE OF INDIANS

AIR QUALITY

REDESIGNATION DOCUMENT

1.0 Introduction

1.1 Purpose

The Spokane Tribe of Indians intends to seek the redesignation of its air quality status to that of Class I air quality. It has asked the U. S. Environmental Protection Agency (EPA) under Tribal Resolution No. 1986-157, for redesignation pursuant to EPA's rule for the Prevention of Significant Deterioration of Air Quality (PSD Rules) written in 1974 (40 CFR 52) and (40 CFR 52.21 (g)) August 7, 1980.

1.2 Background

The Federal clean air act as amended and EPA Indian Policy of 1984 established the authority of the Spokane Tribe to manage the air resources of the Spokane Reservation. It is the prerogative of the Spokane Tribe to provide for protection of its air quality by redesignating the reservation from Class II to Class I pursuant to the Clean Air Act's PSD Program. Redesignation from Class II to Class I would protect to the greatest extent possible under federal law the reservation's air from potential sources of air pollution located on or off the reservation. In order to ensure full air quality protection, some revisions of the Washington State Implementation Plan would be necessary if the Spokane Reservation was redesignated as Class I. The EPA Indian Policy supplements the Clean Air Act and clearly recognizes the tribe's sovereign rights to develop a complete air quality management program.

Air Quality is an important cultural, as well as economic, value to the Spokane Tribe. The Spokane Tribal Council takes seriously its mandate and responsibility to maintain or enhance the quality of life of tribal members, including the health of residents, scenic beauty of the area, culturally significant vegetation, wildlife and fishery habitat, and economic development within the reservation. All of these require the preservation of the existing clean air quality on the reservation.

The Spokane Tribe recognizes its responsibility to work in harmony with its neighbors. This concept is inherent in the Clean Air Act. The Spokane Tribe is committed to working with private and public sector organizations adjoining the reservation to insure that all interests have a proper hearing. The Spokane Tribe is not interested in the issue of development versus nondevelopment. No attempt to preempt development or activities occurring on, or planned outside the reservation is being made. The only issue at stake is the tribe's wishes to protect and enhance the reservation's air quality for the betterment of existing and future generations of the Spokane Tribe.

Air quality issues need to be considered in conjunction with other tribal values and goals. The Spokane is pursuing the classification of Class I air in an effort to establish parameters for development within the Spokane Reservation. It is imperative that these development goals be structured under environmentally sound guidelines.

1.3 Scope.

The following document will attempt to illustrate the impacts of air quality redesignation through a discussion of the existing environmental and socioeconomic conditions on the Spokane Reservation. Specific policies and regulations will be discussed and analyzed pursuant to the tribe's redesignation request. The various impacts of redesignation on reservation environment and socioeconomic structure will be detailed along with a report on impacts to regional air quality.

2.0 HISTORY OF THE SPOKANE INDIAN RESERVATION

The following is not meant to be an exhaustive study of the Spokane people, but merely a brief historical synopsis of significant events and their impact on the Spokane Tribe. The writer wishes to acknowledge the writings of Spokane Tribal member David C. Wynecoop, entitled, "Children of the Sun". Much of this synopsis has been influenced by his book.

The Spokane Indians are of the Interior Salish group which has inhabited northeastern Washington, northern Idaho, and western Montana for centuries. Tribal legends tell of the tribe as having always been in this area. The aboriginal lands occupied by the Spokanes laid in eastern Washington along the Spokane River and surrounding area encompassing some three million acres. The tribe originally consisted of three bands who were designated the Upper, Middle and Lower. The reach of the Spokane River and each bands proximity to it defined their geographic status.

The most reliable estimation in 1880 of the Spokane population was 3,000. Small pox and flu epidemics decimated much of the population with and estimated number of 800 living in the early 1900's.

Prior to the advent of white influence the Spokanes living cycle was based on hunting, fishing and gathering within a vast and bountiful land. Salmon was perhaps the most important commodity in the early economy of the tribe. It was the major subsistance food and trade item of the Spokanes. Many Tribal histories are replete with the injustices done to Indian Tribes under the doctrine of "Manifest Destiny". The Spokanes were not excluded from this litany of tragic events which forever changed their cultural patterns.

With the advent of opening tribal lands to non-Indian settlement much pressure was placed on the tribal bands to move on to reservations established in Washington and Idaho. The movement of the Spokane people onto reservations was only accomplished after years of confrontation and war. On January 18, 1881 an Executive Order was issued by President Rutherford Hayes establishing the Spokane Indian Reservation. As established, the reservation contained 154,602.57 acres.

The vagaries of exploitation was not uncommon to the many tribes of the northwest. The Spokanes and their neighboring tribes lands were coveted and any resistance by the tribes to the theft of their lands was met with staggering military and political force. The Donation Act opened their lands to homesteading. Military scorched earth policies starved and isolated them further. After given a minuscule amount of land their reservation was opened to mineral entry. During this time, and due to the ever expanding city of Spokane prime fishing sites were destroyed by white interest.

"One of the more recent "gifts" of Indian lands occurred as a result of the Act of march 3, 1905, which provided for the acquisition of water rights in the Spokane River along the Reservation's southern boundary. The act authorized the Secretary of Interior to sell lands along the north bank of the river (Spokane Reservation) to any citizen, association, or corporation of the United States for power purposes. On November 3, 1906, the Secretary approved the sale of a power site to David Wilson resold the water rights to the Washington Water Power Company for $25,000.00. The Little Falls Power Plant, as it is called today is still owned and operated by the Power Company. The transaction was undoubtedly a step toward the development of waster resources, but the Indian again was the victim of white men's exploitations."
(Children of the Sun)

In the early 1900s reservation lands were again open to homesteading and later land was appropriated by the use of fee patents. The tribe countered much of this activity through purchase programs of their own thus they began to consolidate their reservation lands.

The Indian Claims Commission was created on August 13, 1946, to adjudicate claims filed by Indian tribes against the United

States. As many tribes in the northwest the Spokanes too proceeded with with their claims against the United States, demanding redress for the unreasonably low amount paid the tribe for land ceded in 1887. After years of legal battles, a settlement was reached. On May 29, 1967 the tribe was to receive 6.7 million dollars. Three million was to be paid to individual members. Three million was set aside for the following programs: Land acquisition and consolidation $1,250,000; Resource development $750,000; Credit Program $500,000; Scholarship and Education Grants $250,000. Through the use of these funds and the advent of a variety of resource development projects on the Spokane Reservation the tribe moved rapidly into an era of progressive governmental and economic development. Through their aggressive leadership the tribe constructed new homes, a community center, public utilities and recreational facilities. Timber was harvested; uranium mining was initiated; potential farm lands were reclaimed; small business were developed.

Today the Spokane people are experiencing the same difficulties as many of the neighboring communities. i.e. Timber markets are depressed, farm prices do not support their agricultural development efforts; mining was discontinued due to market conditions. Therefore some of their initial gains have been eliminated by a poor economy. Tribal leadership has met these difficulties with an intense effort to diversify their development efforts. New small businesses have been developed and brought under an enterprise corporation. Management systems have been strengthened and new resource development opportunities are being planned.

Throughout history the Spokane Tribe has met tremendous adversity with courage and a deep commitment to preserve their tribal identity through the wise custodianship of their land.

3.0 ENVIRONMENTAL BASELINE CONDITIONS

In order to understand the effect of air quality on the total reservation ecosystem and human population, identification of existing environmental and socioeconomic conditions needs to be performed. Once this baseline is established, the relationship between tribal air quality values and other tribal resources can be assessed.

Using best-available information, with primary reliance on the Sherwood Project EIS (BIA, 1976) and the Creston Power Plant PSD Permit (TWWPCo, 1982), a baseline assessment of environmental and socioeconomic conditions on the reservation was performed. This analysis includes descriptions of climate and air quality, wildlife, vegetation, soils, hydrology and socioeconomics.

3.1 General Description

The Spokane Reservation is situated within two physiographic provinces of the Pacific Northwest, as described by Franklin and Dyrness (1973). The majority of the area lies within the Okanogan Highlands Province. This province bridges the gap between the northern Cascades in northcentral Washington and the northern Rocky Mountains and is characterized by broad-topped mountains and relatively gently undulating to moderately hilly. Steep slopes are of limited occurrence.

Elevations on the reservation range from approximately 1400 ft along the Spokane River to 3870 ft in the Spokane Mountains. Two major bodies of water, FDR Lake and the Spokane River, border the reservation on the western and southern side, respectively. Other major drainages within the area include Sand Creek, Blue Creek, Little Chamokane Creek and Chamokane Creek, which borders the reservation on the east side.

3.2 CLIMATE AND AIR QUALITY

3.2.1 Regional Climatology

The regional area surrounding the Spokane Reservation and comprising a great portion of the Columbia Basin is relatively arid, with temperature fluctuations. Although the state of Washington is subject to frequent migration of cool, humid Pacific air masses, the majority of this available precipitation falls on the Coast Range and the Cascade Mountains. The resulting drier air mass that reaches the Spokane Reservation tends to combine some of the characteristics of the maritime climate of the coastal area with the arid climate of an interior continental area.

The predominant controls on the climate of the reservation are: (1) location with respect to storm tracks, (2) latitude and (3) location with respect to the mountains. The Pacific Ocean influences the development of coastal storms, which track across the Cascades to the Spokane Reservation area. The relatively high latitude of the area (around 48°N) tends to modify and cool the air masses from the west; in the winter there is little solar radiation to warm the air mass. The coast Range and the Cascade Mountains have a substantial effect on producing the arid conditions in the area; the orographic effect of these mountains causes moisture in the air mass to fall as rain or snow on the windward (west) side of the mountains.

The climate combines some of the characteristics of damp, coastal weather and arid, interior conditions. Most of the air masses which reach Spokane are brought in by prevailing westerly and southwesterly circulations. Frequently, much of the moisture in the storms that move eastward and southeastward from the Gulf of Alaska and the eastern Pacific Ocean is precipitated out as the storms are lifted across the Coast and Cascade ranges. Annual precipitation in the Spokane area is generally less than 20 in. and less than 50% of the amounts received west of the Cascades. However, precipitation and total cloudiness in the Spokane Vicinity is greater than those of the desert areas of southcentral Washington. Lifting of the air masses up the east slope of the Columbia Basin frequently produces the cooling and condensation necessary for formation of clouds and precipitation.

Infrequently, the Spokane area comes under the influence of dry continental air masses from the north or east. On occasions when these air masses penetrate into eastern Washington, the result is high temperature and very low humidity in the summer or subzero temperature in the winter. In the winter, most of the severe arctic air moves southward on the east side of the Continental

Divide and does not affect Spokane.

In general, the Spokane Reservation weather has the characteristics of a mild, arid climate during the summer months and a cold, coastal climate in the winter. Approximately 70% of the total annual precipitation falls between the first of October and the end of March, and about half of that falls as snow. Winter weather includes many cloudy or foggy days and below-freezing temperatures, with occasional snowfall of several inches. Sub-zero temperatures and traffic-stopping snowfalls are infrequent. The growing season usually extends over nearly six months, from mid-April to mid-October. Irrigation is required for all crops except dryland grains. The summer weather is ideal for full enjoyment of the many mountain and lake recreational areas in the immediate vicinity.

In the region surrounding the Spokane reservation, climate can vary as a function of elevation. For many of the localities above 2000 ft, increased precipitation can occur, due to orographic lifting. Temperatures can be cooler at higher elevations, and wind velocities can vary according to terrain features, with higher winds expected at ridgetops and lower winds expected in protected valleys.

3.2.2 Reservation Climate

A limited amount of climatological data is available for the Spokane Reservation (BIA, 1976). A detailed discussion of climate for the Creston area is found in TERA (1981). In addition, a long-term record of over 80 years is available for the town of Spokane, which is located approximately 40 mi southeast of the reservation. The basic data for both areas are shown in tables 3-1, 3-2, and 3-3.

Temperature-The annual average temperature on the reservation is around 45°F with a monthly average variation 22°F in the winter to 71°F in August. This temperature is lower than the annual average temperature measured in the town of Spokane (table 3-1). The highest temperature measured in Spokane was 100°F and the lowest was -25°F (table 3-2). Minimum temperatures of -10°F to -20°F are recorded almost every winter. A substantial variation of temperature From year to year is noted in table 3-3.

Precipitation-Around 16 to 20 in./yr of precipitation falls in the area. The reservation gets more precipitation than does the town of Spokane. Around half of the precipitation occurs in the winter months and a minimum of summer precipitation is noted. The maximum annual precipitation is around 11 in. A large amount of precipitation occurs as snow. The reservation records almost 58 inches of snow fall, on the average, each year; tables 3-2 and table 3-3 indicate that snowfall can vary from 15 to 94 in.

Wind-The annual average wind measured in Spokane is 8.7 mi/hr (table 3-2). The prevailing direction is Spokane is SSW in the summer and NE in the winter. the annual wind rose for Spokane is shown in figure 3-1. However, data collected at the Creston Power Plant would probably be more indicative of the wind conditions on

Table 3-1. WELLPINIT AND SPOKANE CLIMATOLOGICAL DATA [a]

Location and Parameter (b)	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Wellpinit (c)													
Precipitation	2.57	1.90	1.80	1.45	1.68	1.67	0.49	0.63	1.10	1.79	2.34	2.75	20.17
Snow	16.7	12.4	4.8	0.7	0.1	0.0	0.0	0.0	0.0	0.9	6.6	15.7	57.9
Temperature (d)	21.9	29.4	39.7	41.0	54.3	60.4	65.3	70.9	57.8	44.6	35.3	22.0	44.7
Spokane (e)													
Precipitation	2.11	1.60	1.33	1.08	1.33	1.31	0.49	0.59	0.84	1.26	2.00	2.21	16.15
Snow	15.6	6.1	4.1	0.3	0.1	0.0	0.0	0.0	0.0	1.4	4.8	12.7	46.1
Temperature	26.9	31.7	39.5	47.7	55.9	62.5	70.2	68.7	59.4	48.7	37.1	30.3	48.2
Average Maximum Temperature	32.7	38.8	48.4	58.6	67.6	74.5	84.3	82.9	72.2	59.3	43.6	35.5	58.2
Average Minimum Temperature	21.0	24.5	30.5	36.8	44.2	50.5	56.0	54.5	46.6	38.1	30.5	25.1	38.2

(a) From U.S. Weather Bureau (1955 and 1962) and Environmental Data Services (1972a and 1972b)
(b) Precipitation in inches of total moisture as a water equivalent; snow in inches, and temperature in degrees Fahrenheit.
(c) Data are averages from 1931 through 1960.
(d) 1972 data only.
(e) Data are averages from 1933 through 1972.

Table 3-2. SPOKANE, WASHINGTON CLIMATOLOGICAL DATA

Meteorological Data For The Current Year

Station: SPOKANE, WASHINGTON INTERNATIONAL AIRPORT Standard time used: PACIFIC Latitude: 47° 38' N Longitude: 117° 32' W Elevation (ground): 2356 feet Year: 1979

Month	Temp °F Avg Daily max	Daily min	Monthly	Extremes Highest	Date	Lowest	Date	Degree days Base 65 °F Heating	Cooling	Precip Water equiv Total	Greatest in 24 hrs	Date	Snow, Ice pellets Total	Greatest in 24 hrs	Date	RH pct 04	10	16	22
JAN	30.0	17.2	22.0	47	18	-2	8	1324	0	0.79	0.40	11-12	8.0	3.3	11-12	91	90	89	90
FEB	41.4	27.0	35.1	57	12	17	24	831	0	0.32	0.22	20	2.5	0.0	22	85	81	66	81
MAR	46.7	29.7	38.2	61	22	24	20	824	0	1.13	0.30	7	2.7	1.2	10	79	67	53	72
APR	55.0	36.7	45.9	70	24	25	19	438	10	0.15	0.10	13	T	T	18	80	61	26	63
MAY	62.2	40.0	51.4	81	1	33	6	409	2	1.71	0.42	17-18	T	T	21	77	37	43	60
JUN	75.1	51.0	63.0	90	9	38	7	66	72	1.69	1.13	7-8	0.0	0.0		69	44	30	53
JUL	80.9	55.9	67.0	94	28	41	6	37	110	0.11	0.09	26-27	0.0	0.0		67	30	26	62
AUG	84.0	57.4	71.2	100	18	46	31	36	234	1.25	0.39	23-24	0.0	0.0		79	47	28	46
SEP	84.9	55.2	55.1	81	13	32	27	289	0	1.47	0.47	23-24	0.0	0.0		84	64	31	71
OCT	57.3	35.7	46.9	67	24	25	10	563	0	0.44	0.20	20	0.0	0.0		83	70	46	78
NOV	40.4	27.6	34.0	55	1	3	21	921	0	2.13	0.67	25	11.2	3.3	0	81	77	69	77
DEC	32.3	20.1	26.2	51	8	-9	31	1197	0	4.32	0.90	13-14	30.5	7.0	29	88	87	81	86
YEAR	56.0	37.0	46.9	100	AUG 18	-9	DEC 31	6974	472	15.57	1.13	JUN 7-8	53.5	7.0	DEC 29	77	63	51	67

Month	Wind Resultant Direction	Resultant Speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Date	Percent of possible sunshine	Average sky cover tenths, sunrise to sunset	Number of days Sunrise to sunset Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility 1/4 mile or less	Temperature °F Maximum 90° and above	Maximum 32° and below	Minimum 32° and below	Minimum 0° and below	Average station pressure mb Elev. 2369 feet m.s.l.
JAN	09	0.7	6.0	27	SW	10	31	8.4	0	8	23	8	2	0	8	0	27	30	1	937.6
FEB	10	2.5	8.4	32	SW	10	56	8.3	1	6	21	7	0	0	3	0	3	23	0	936.7
MAR	21	7.4	11.0	35	NW	27	40	8.3	0	7	24	11	1	0	3	0	0	24	0	930.8
APR	21	3.3	9.4	38	SW	8	66	7.9	0	15	9	1	0	0	0	0	0	10	0	932.5
MAY	20	6.0	10.0	29	W	6	67	8.4	0	9	22	15	0	0	2	1	0	8	0	927.8
JUN	22	3.7	9.1	36	W	7	70	6.2	7	13	12	7	0	0	1	1	0	0	0	931.6
JUL	21	0.9	10.4	29	W	20	61	5.7	8	11	12	9	0	0	0	7	0	0	0	932.3
AUG	20	2.4	9.0	29	NE	4	80	5.9	17	7	7	9	0	1	1	16	0	0	0	929.6
SEP	18	3.6	7.6	28	SW	20	48	6.0	0	5	19	12	0	0	1	0	0	1	0	930.6
OCT	19	2.7	7.8	32	SW	30	56	6.3	0	7	16	5	0	0	0	0	0	1	0	934.6
NOV	20	4.7	11.4	40	SW	1	30	7.5	4	9	17	12	2	0	1	0	3	19	0	932.3
DEC	21	3.3	10.3	42	W	8	23	7.9	3	6	22	18	8	0	2	0	17	25	2	929.7
YEAR	20	3.8	9.1	42	W	DEC 8	51	7.0	63	94	206	104	13	7	30	23	34	141	3	931.9

Normals, Means, And Extremes

Month	Temp °F Normal Daily maximum	Daily minimum	Monthly	Extremes Record highest	Year	Record lowest	Year	Normal Degree days Base 65 °F Heating	Cooling	Precip Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs	Year	Snow, Ice pellets Maximum monthly	Year	Maximum in 24 hrs	Year
(a)				30		30					30		30		30		30		30	
J	31.1	19.6	25.4	59	1971	-19	1969	1228	0	2.47	4.96	1950	0.50	1949	1.40	1950	56.9	1950	12.0	1950
F	39.0	25.3	32.2	61	1958	-12	1973	910	0	1.80	3.94	1961	0.40	1967	1.11	1968	20.3	1975	8.9	1975
M	46.2	28.0	37.3	71	1960	-3	1955	853	0	1.33	3.79	1950	0.01	1965	0.91	1950	13.3	1957	3.3	1970
A	57.0	33.2	46.1	90	1977	17	1968	567	0	1.17	3.08	1948	0.08	1956	0.90	1962	6.6	1964	4.0	1964
M	66.3	42.0	54.7	97	1964	24	1956	327	0	1.46	3.71	1948	0.45	1964	1.07	1948	3.5	1967	3.5	1967
J	73.6	49.4	61.5	100	1975	34	1962	144	39	1.38	3.04	1964	0.16	1960	2.07	1966	T	1954	T	1954
J	84.3	55.1	69.7	103	1967	38	1971	21	167	0.40	1.00	1973	T	1970	0.86	1973	0.0		0.0	
A	81.9	54.0	68.0	108	1961	35	1965	47	140	0.58	1.85	1976	T	1969	1.00	1959	0.0		0.0	
S	71.5	46.7	59.0	96	1950	25	1965	196	54	0.83	2.05	1959	0.03	1975	1.12	1975	0.0		0.0	
O	58.1	37.5	47.8	83	1965	13	1971	533	0	1.42	4.05	1950	0.05	1965	0.90	1953	0.1	1957	0.1	1957
N	41.0	29.2	35.5	67	1975	-11	1955	887	0	2.26	9.10	1973	0.22	1976	1.41	1960	24.7	1955	9.0	1975
D	33.9	24.0	29.0	54	1957	-25	1968	1116	0	2.37	9.13	1964	0.60	1976	1.60	1951	42.0	1964	12.1	1951
YR	57.2	37.3	47.3	108	AUG 1961	-25	DEC 1968	6835	388	17.42	5.71	MAY 1948	T	JUL 1973	2.07	JUN 1966	56.9	JAN 1950	13.0	JAN 1950

Month	RH pct 04	10	16	22	Wind Mean speed m.p.h.	Prevailing direction	Fastest mile Speed m.p.h.	Direction	Year	Pct. of possible sunshine	Mean sky cover tenths, sunrise to sunset	Mean number of days Sunrise to sunset Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility 1/4 mile or less	Temperature °F Max 90° and above	Max 32° and below	Min 32° and below	Min 0° and below	Average station pressure mb Elev. 2369 feet m.s.l.
(a)	18	18	18	18	30	15	30	30		29	30	30	30	30	30	30	30	30	18	18	18	18	8
J	88	87	77	88	8.5	NE	59	SW	1972	26	8.7	3	5	23	15	6	0	9	0	13	27	3	932.0
F	87	76	60	79	9.2	SSW	56	SW	1949	40	7.8	4	6	20	13	3	0	7	0	4	23	1	932.0
M	78	67	54	77	9.6	SSW	54	SW	1971	38	7.4	4	8	19	11	2	0	3	0	1	22	0	928.4
A	73	56	43	64	9.7	SW	50	SW	1962	60	7.1	5	8	17	11	1	1	1	0	0	12	0	931.0
M	74	51	40	62	8.9	SSW	49	W	1957	63	6.6	6	10	15	8	0	1	1	0	0	3	0	930.6
J	72	48	35	58	8.9	SSW	59	SW	1949	65	6.1	7	11	12	9	0	3	1	3	0	0	0	930.4
J	60	38	25	47	8.3	SW	43	SW	1970	80	3.6	17	9	5	4	0	3	0	10	0	0	0	931.0
A	61	43	28	49	8.1	SW	42	SW	1976	77	4.1	16	8	7	5	0	2	0	8	0	0	0	930.8
S	69	50	34	54	8.0	NE	50	SW	1961	70	4.9	13	8	10	6	0	1	1	1	0	1	0	932.0
O	79	66	49	71	8.1	SSW	56	SW	1950	51	6.9	8	8	16	8	0	0	3	0	0	9	0	933.6
N	86	81	74	85	8.3	NE	54	SW	1949	28	8.0	3	5	21	15	2	0	9	0	3	20	0	932.0
D	86	86	81	87	8.0	NE	61	SW	1956	20	8.5	3	5	23	16	5	0	12	0	13	26	1	932.0
YR	73	62	51	64	8.7	SSW	59	SW	JAN 1972	57	6.5	86	87	190	114	18	11	47	21	34	141	6	931.8

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows: Lowest temperature -30 in January 1888; maximum monthly precipitation 5.83 in November 1897; minimum monthly precipitation 0.00 in July 1881; maximum precipitation in 24 hours 3.22 in June 1886.

(a) Length of record, years, through the current year unless otherwise noted, based on January data.
(b) 70° and above at Alaskan stations.
* Less than one half.
T Trace.

NORMALS - Based on record for the 1941-1970 period.
DATE OF AN EXTREME - The most recent in cases of multiple occurrence.
PREVAILING WIND DIRECTION - Record through 1963.
WIND DIRECTION - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm.
FASTEST MILE WIND - Speed is fastest observed 1-minute value when the direction is in tens of degrees.

Table 3-3. SPOKANE, WASHINGTON CLIMATOLOGICAL DATA

Average Temperature

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Precipitation

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Snowfall

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

the Spokane Reservation. Figure 3-2 illustrates the wind rose for the Creston Power Plant for a limited amount of data collected in 1980 (TERA, 1981). The prevailing wind directions are SSW and NE. The winds for 1980 at Creston are more evenly distributed than those at the town of Spokane.

Local winds on the reservation would be expected to follow terrain features. Winds are usually moderate to light year around. However, gusty surface winds, associated with frontal passages, can occur. Given the reservation's geographic location, local winds are probably characterized as valley-induced winds systems. Nocturnal cooling of ridges results in downslope drainage along river valleys. The flow of this cold air over the valley floor underlies warmer air aloft, which is usually flowing from the northwest. If the valley ridges are sufficiently warmed, nighttime drainage is replaced by up-valley air. Whether or not this occurs, depends on the balance of daytime radiational heating and nighttime radiational cooling (figure 3-3).

The area has a high frequency of near-calm wind conditions and a moderate frequency of storms. Surface winds are predominantly downslope in the mornings, with speeds generally less than 10 mi/hr; upslope winds in the afternoons and evenings are from some westerly direction, with slightly higher speeds. Spring winds will average approximately 10 mi/hr, although gusts of 40 to 50 mi/hr or more are common.

Atmospheric Dispersion-The atmosphere's ability to disperse pollutants is measured by a number of parameters. The mixing height, the depth of the inversion, measures the vertical extent of mixing of atmospheric pollutants. The lower the mixing height, the less dispersion.

Low-level, radiation-induced inversions form in arid climates. In addition, wintertime synoptic inversions can be formed in the area. Figures 3-4 and 3-5, from Holtzworth (1972), illustrate the average annual morning and afternoon mixing height is around 400 m, and the afternoon mixing height rises to almost 1600 m. Table 3-4, taken from TERA 91981), one-half of the time at night and one-third of the time overall. Although the data are limited, it seems appropriate to assume that a high frequency of temperature inversions occur in the fall and winter on the reservation. The continental climate, producing nighttime radiative cooling, coupled with occurrences of upper air high pressure induced subsidence, tends to form temperature inversions.

Another atmospheric dispersion parameter is atmospheric stability. Stability is a measure of the atmosphere's relative ability to disperse pollutants at small scales. Appendix A illustrates atmospheric stability in more detail. Other stability Information for the town of Spokane is shown in Appendix B. A stability array (STAR) for Spokane is summarized in table 3-5; very stable conditions (D, E, and F) are the most prevalent. Atmospheric pollutants, on the average, are not easily dispersed on the reservation unless strong winds are present.

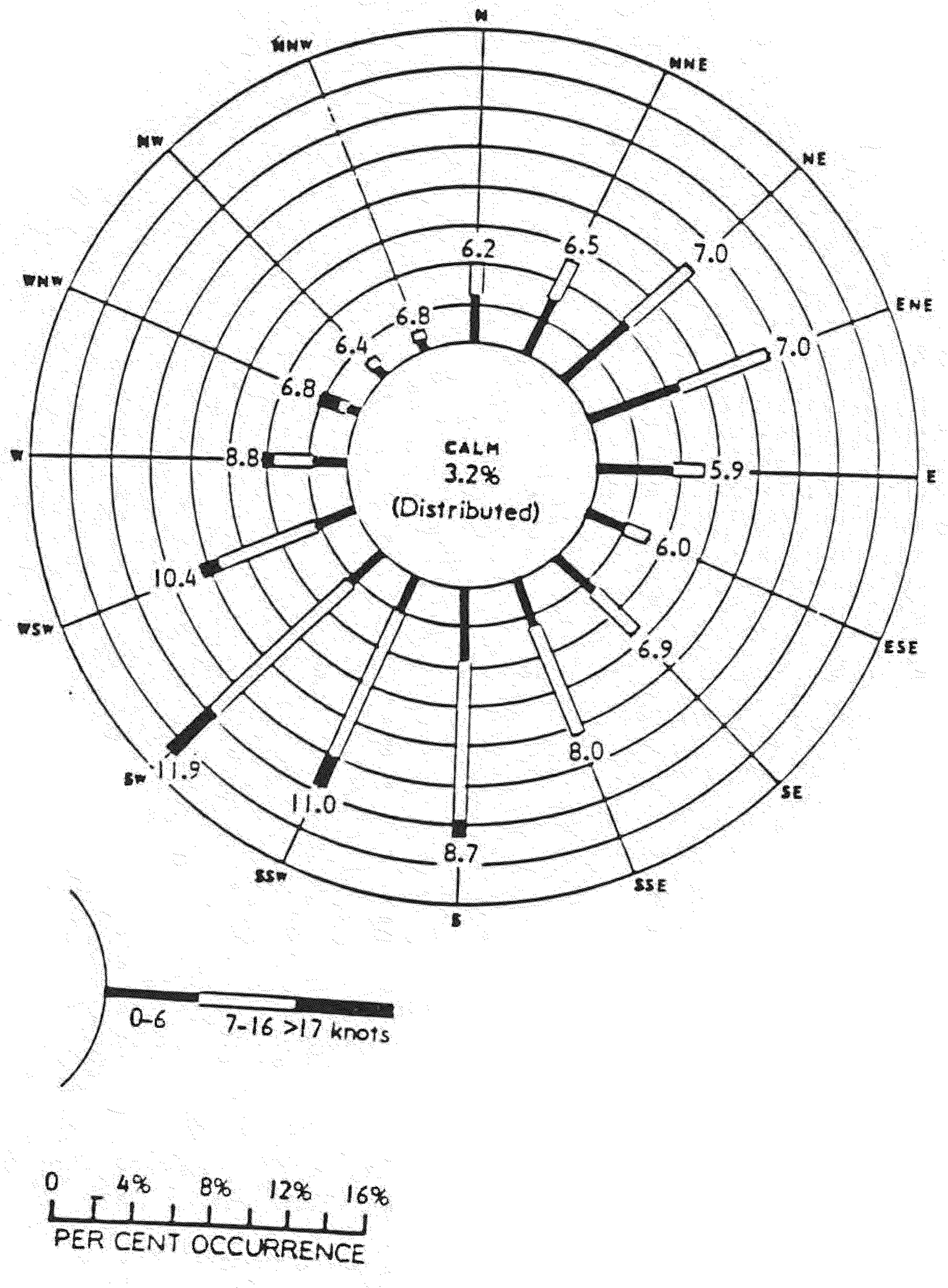


Figure 3-1. ANNUAL WIND ROSE FOR SPOKANE INTERNATIONAL AIRPORT (1968-77)

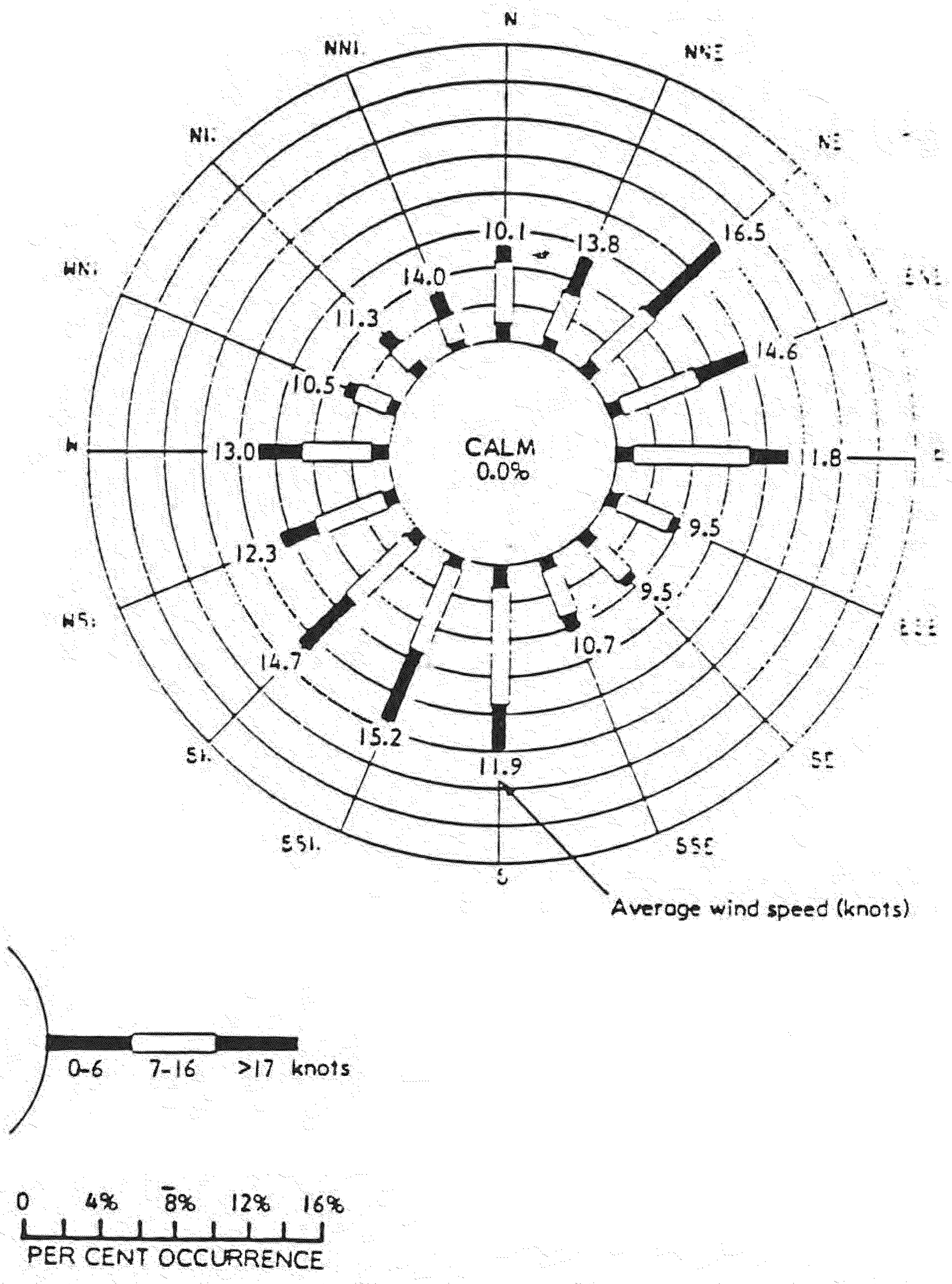
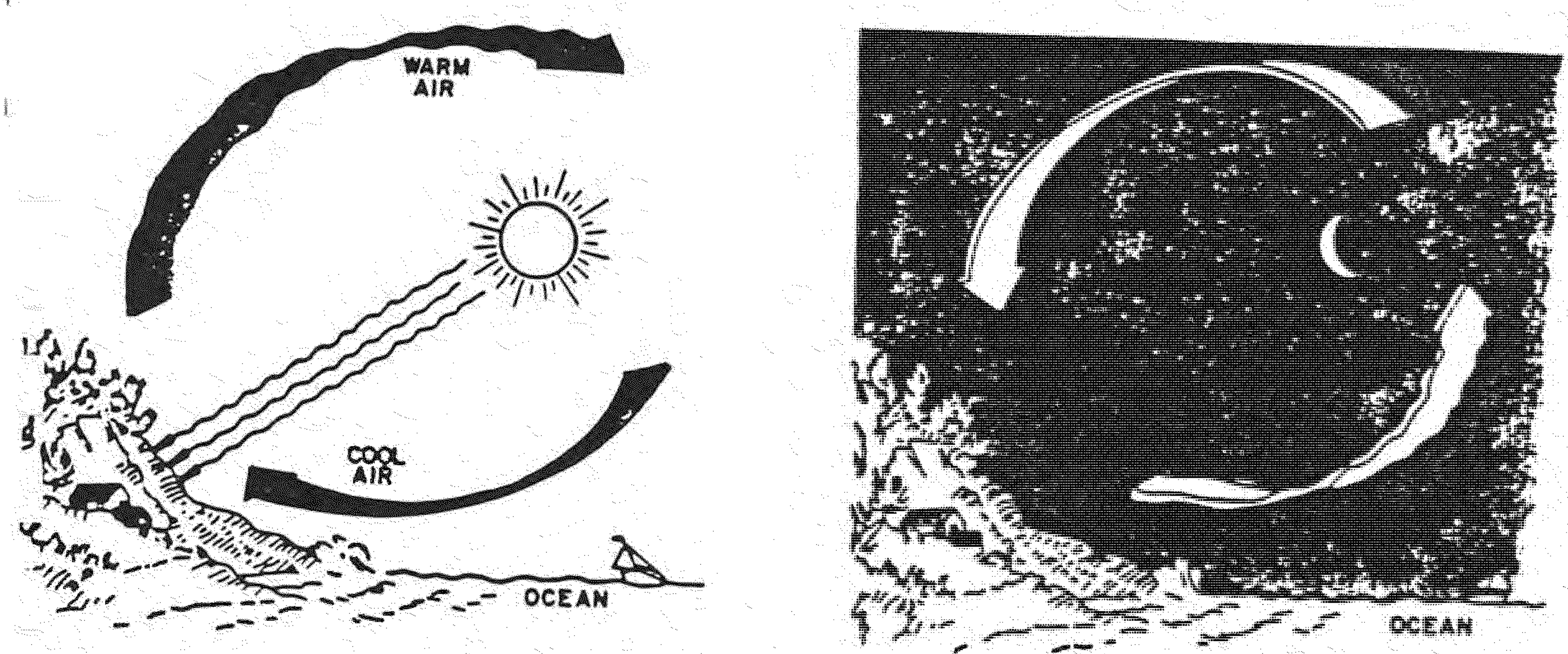
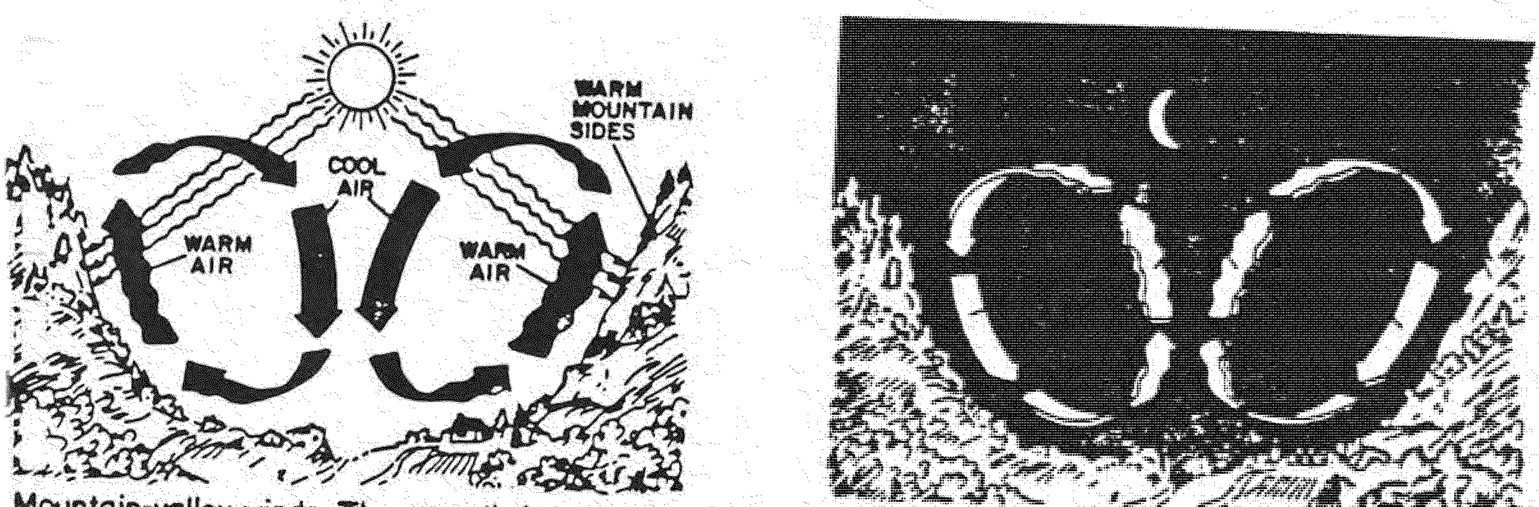


Figure 3-2. CRESTON GENERATION STATION
WIND ROSE FOR 1980 FROM TWWPCO CRESTON BUTTE TOWER, 100-M LEVEL



Sea-land winds occur because adjacent land and ocean masses have different rates of heating and cooling. On-shore breezes occur during the day and off-shore breezes at night.



Mountain-valley winds. These gentle breezes occur because the air over high mountain slopes warms faster by day and cools down more rapidly at night.

Figure 3-3. DAYTIME RADIATIONAL HEATING AND NIGHTTIME RADIATIONAL COOLING

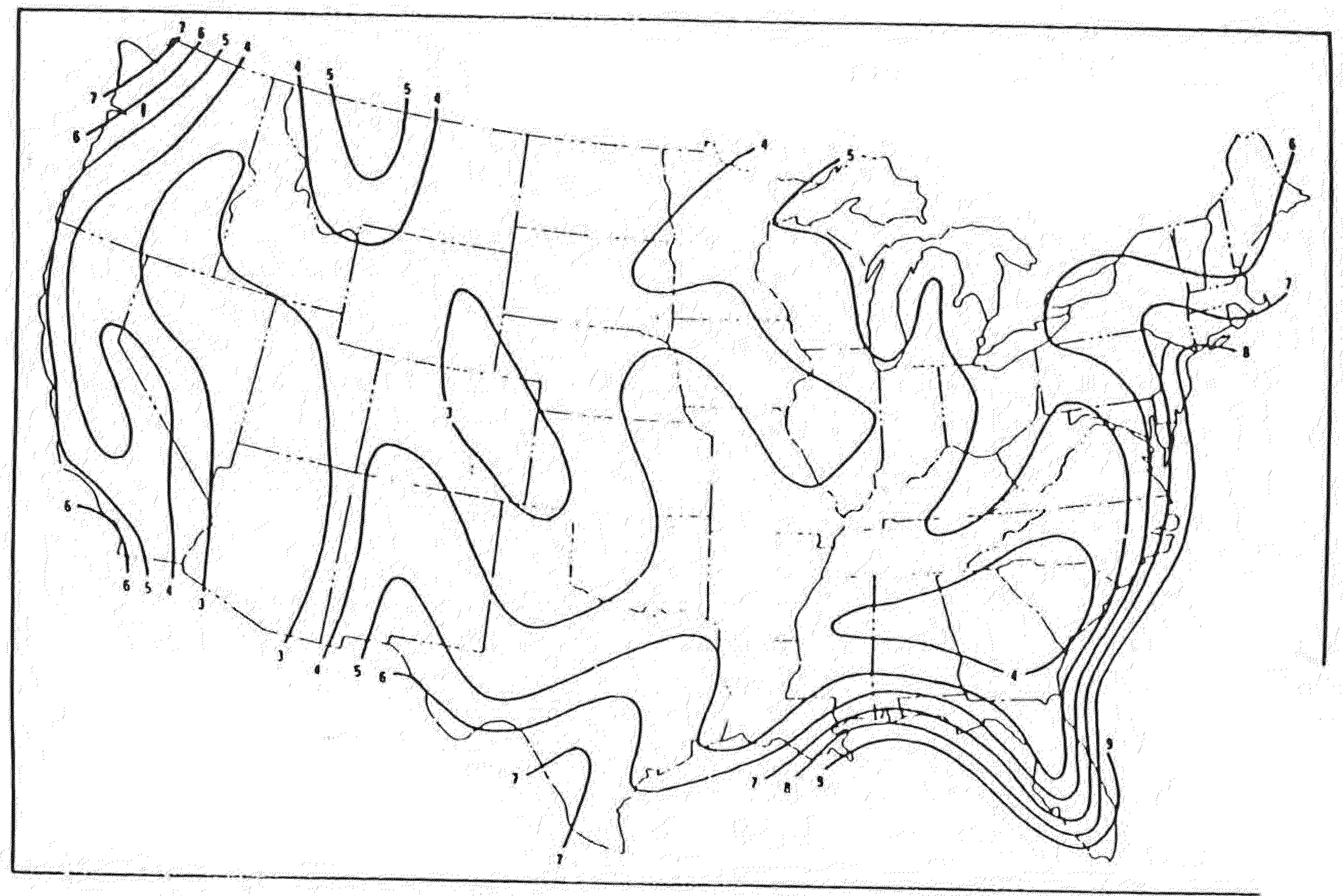


Figure 3-4. ISOPLETHS (M X 10^2) OF MEAN ANNUAL MORNING MIXING HEIGHTS

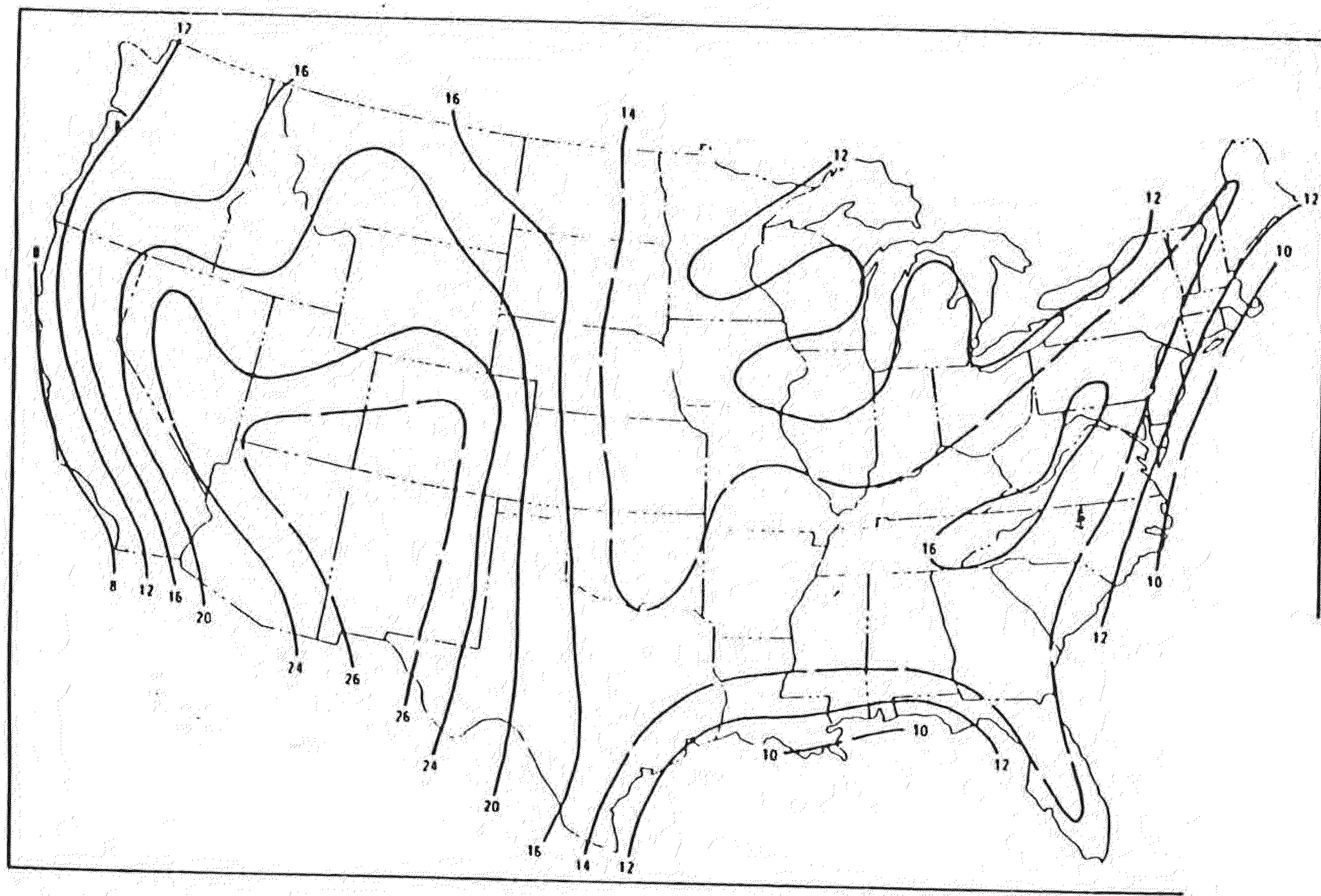


Figure 3-5. ISOPLETHS (M X 10^2) OF MEAN ANNUAL AFTERNOON MIXING HEIGHTS

Table 3-4. LOW-LEVEL INVERSION FREQUENCY IN PROJECT AREA

Period	Frequency of Inversion (% of total time)	Frequency of Nighttime Inversion (% of total time) indicated by		
		Wind Speed $\leq$ 7 mph	Cloud Cover $\leq$ 3/10	Average
Spring	29	57	39	48
Summer	31	66	62	64
Fall	40	68	47	57
Winter	37	55	19	40
Annual	34	61	42	52

Source: Hosler, 1961.

Other. The pan evaporation rate on the reservation is approximately 50 in./yr (BIA, 1976). The heating degree days at Spokane average over 6800/yr. The number of cloudy days in Spokane exceeds 190 days/yr.

3.2.3 Air Quality

Air quality data for the Spokane Reservation are lacking. The state of Washington operates a monitoring network in the area, with TSP stations at Spokane, Cheney, Clarkston and Colfax. The Washington Water Power Company (TWWPCo) is currently monitoring air quality near Creston, but recent data are not yet available.

Ambient Air Quality Data-Ambient air quality data have been collected at Spokane, Davenport and the Creston site. Data for Spokane are not appropriate for use on the reservation, since they represent an urban environment. Table 3-6, taken from TERA (1981), summarizes existing air quality, as measured in the Creston area by TWWPCo. All pollutants monitored were below ambient air quality levels. Only Total Suspended Particulates (TSP) levels are close to the standards.

Emissions of Air Pollutants. A complete emissions inventory has not been prepared for the reservation. Information collected for the Creston Project (TERA, 1981) indicated that only very minimal emissions of air pollutants from stationary sources were produce in the area. Clearly, the most significant sources of air pollutants were from vehicles travelling over unpaved roads, from agricultural activities and from forest management activities. None of these sources is subject to PSD control by permit.

Given the terrain of the area and the lack of existing sources on or near the reservation, it is assumed that reservation air quality is excellent.

Classification of Air Quality and Location of Air Quality Designated Areas. The Spokane Reservation is currently designated as a class II PSD area, with no violations of human health-related ambient air quality standards noted on the reservation. The Class II designation applies to most of the United States and implies that a moderate level of industrial growth would be permitted on the reservation.

All of the area near the reservation is also designated as Class II air quality. Over 100 mi from the reservation, Class 1 areas exist at Cabinet Mountains (Montana), Glacier Peak Wilderness Area, Pasayten Wilderness Area and North Cascades National Park. As previously indicated, the Class I designation is reserved for clean, pristine areas and would permit little or no industrial development on or near these areas.

The extent of these Class I areas would not affect energy development on the reservation.

Ambient Air Quality Standards. Air quality standards have been set by the federal and state governments to protect human health and welfare and to ensure that air quality is not significantly degraded. For most development on the reservation, two sets

Table 3-5. STABILITY ARRAY (STAR) FOR SPOKANE, WASHINGTON
1968 - 1977

Period	Frequency of Stability Occurrence (Percent)					
	A	B	C	D	E	F
Annual	0.3	4.1	10.7	57.1	14.3	13.6
Winter	-	0.5	3.8	74.9	10.2	10.6
Spring	0.1	3.9	10.8	59.4	14.6	11.2
Summer	0.8	8.8	18.3	38.8	16.9	16.3
Fall	0.0	3.0	9.7	55.5	15.6	16.2

Period	Average Wind Speed (Knots)						
	A	B	C	D	E	F	Average
Annual	3.3	5.2	7.4	10.4	6.8	3.8	8.4
Winter	-	2.2	5.8	9.9	6.4	3.6	8.7
Spring	2.1	5.0	7.2	11.1	6.8	3.8	9.0
Summer	3.5	5.6	8.2	11.1	7.0	4.0	8.1
Fall	-	4.7	6.8	9.7	6.7	3.6	7.8

Table 3-6. EXISTING AIR QUALITY RELATIVE TO APPLICABLE STAND
IN THE CGS IMPACT AREA

Pollutant	Averaging Time	Estimated Existing Air Quality[a] (ug/m^3)	Standards[a,b]		
			National		Washington State
			Primary (ug/m^3)	Secondary (ug/m^3)	(ug/m^3)
TSP	Annual	36[c,h]	75	60	60
	24-Hour	112[g]	260	150	150
SO_2	Annual	5.2[c,d]	80	—	52
	24-Hour	15.6[c,d,e]	365	—	260
	3-Hour	20.8[c,d,e]	—	1,300	—
	1-Hour	20.8[c,d,e]	—	—	1,040
NO_2	Annual	4.0[c,d]	100	100	100
O_3	1-Hour	137[e,f]	235	235	235
CO	8-Hour	571[e,f]	10,000	10,000	10,000
	1-Hour	1,371[e,f]	40,000	40,000	40,000
Lead	3-Month (Calendar Quarter)	Negligible	1.5	1.5	—

of ambient air quality standards apply: National Ambient Air Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments.

National Ambient Air Quality Standards. Ambient air quality standards set by the federal government to protect human health and welfare are shown in table 3-7. The national primary standards are those set to protect human health only, and the national secondary standards are those set to protect human welfare (i.e., protection of vegetation, property, esthetics, etc.).

Prevention of Significant Deterioration (PSD) Increments. Through court-initiated action in 1974, the EPA promulgated regulations to prevent emissions of sulfur dioxide (SO_2) and total suspended particulates from significantly degrading air quality in those areas of the country where their concentrations were below national ambient air quality standards. Prevention of Significant Deterioration regulations require that an operator of certain new or modified facilities demonstrate compliance with the law and obtain a permit from the EPA or its delegated authority before construction and operation of the facility can commence. These regulations stipulate that the source (1) would not cause ambient air quality levels which would significantly degrade existing air quality and (2) would use Best Available Control Technology to limit emissions.

There are three area classifications for the prevention of Significant Deterioration: Class I, Class II and Class III.

Generally speaking, Class I is the designation for clean, pristine areas and would permit little or no development; Class II designation is for clean areas where a moderate amount of development would be permitted; and Class III is the designation for clean areas where a significant amount of development would be permitted, as long as national ambient air quality standards were not exceeded.

The PSD classifications were initially defined in the Clean Air Act as follows:

- Class I: International parks, all national wilderness areas over 5,000 A, all national memorial parks over 5,000 A and all national parks over 6,000 A;
- Class II: All other areas in country which are not exceeding the National Ambient Air Quality Standards; and
- Class III: None.

The Clean Air Act specified that Indian tribes could redesignate from Class II to Class I, if certain procedures were followed. To date, the Northern Cheyenne, Fort Peck and Flathead Indian reservations have been redesignated as Class I.

The PSD standards are defined as ambient air increments above the baseline air quality. The PSD incremental standards were shown in table 2-1. Since some of the values in table 2-1 are below air quality instrumentation sensitivity, the primary determination of compliance with PSD standards is by air pollution dispersion modeling. In fact, the levels measured are very low and are close to minimum detectable ranges of the monitoring equipment.

Visibility. Visibility or visual-range-related measurements have been made at Spokane and Seattle. (visual range is the greatest distance one can discern objects or targets.) Visual range data collected at these and other national sites were used to develop the information presented. The Spokane Reservation is located in an area of average visual range (greater than 25 mi. on the average).

It is concluded from this information that air quality on the reservation is excellent. However, any energy development proposed in the area could affect air quality on the reservation. In order to properly track energy growth, a reservation ambient air quality monitoring program should be initiated.

3.3 FISH AND WILDLIFE RESOURCES

This section presents a baseline description of the wildlife resources of the Spokane Reservation, based on existing published and nonpublished reports. Since site-specific wildlife data have not been collected on a majority of the reservation, this description should be considered preliminary until a detailed survey is conducted.

3.3.1 Habitats

The Spokane Reservation is dominated by coniferous forest which provides habitat for a wide variety of wildlife species. The coniferous forest can be divided into two types of habitat, the open and closed canopy coniferous forests. The open canopy coniferous forest is generally located on southern exposures, with stands of ponderosa pine and Douglas fir predominating and an understory of grass species. The closed canopy coniferous forest is usually on north slopes on moist sites and consists primarily of grand fir and Douglas Fir. Other important habitats on the reservation are openings created by logging and agricultural practices, lakes, ponds and marshes. In addition, many creeks are found within the reservation, and the Spokane River and Franklin D. Roosevelt (FDR) Lake, the reservoir created by Grand Coulee Dam, border the reservation. These waters provide excellent aquatic habitats for fishes and other aquatic species and also provide riparian habitat for terrestrial animals that depend on the edges between terrestrial and aquatic habitats.

3.3.2 Mammals

Mammals known or expected to occur in the general vicinity of the Spokane Reservation are listed in table 3-8.

Major big game species occuring in the area include white-tailed deer, mule deer and black bear. Other less common big game species on the reservation are elk and moose. There are occasional sightings of elk on the reservation (BIA, 1983); these are probably resident elk.

According to Poelker and Hartwell (1973), the subspecies of black bear that occurs within the reservation proper is the <u>Ursus americana cinnomomum</u>. The black bear population in the general area has been on the increase. This increase is reflected in the Harvest data of the Huckleberry Mountain Management Area just north of the reservation (Zender, 1984). Zender indicated more bears in young age classes are taken during harvest in the management area. Although the bear population is on the increase, poaching and lack of berry-producing forage species for fall use are thought to be the primary limiting factors of the Huckleberry Mountain management area. This may also be the case for the reservation.

The reservation provides year-round habitat for both species of deer. The population ratio is approximately 90% whitetail and 10% mule deer in the Huckleberry Mountain Management Area (BLM,n.d.). The mule deer population has been decreasing, whereas the whitetail population has been increasing for the last three years (Zender, 1984). Zender attributes this to change in habitat. For example, logged areas are being replaced by brushy vegetation which the whitetail prefers. There is also succession of conifers into open areas typical of mule deer ranges in northeastern Washington (BLM,n.d.). In addition, the whitetail tends to be more adaptable to human presence and to change in habitat.

Carnivorous species present on the reservation are coyote, cougar, bobcat, raccoon, weasel, mink, marten, badger and skunk. Major species of small mammal in the area include porcupine, cottontail, jackrabbit, beaver, muskrat and numerous smaller rodents such as chipmunk, squirrel, pocket gopher, mice and rats.

Table 3-7. NATIONAL AMBIENT AIR QUALITY STANDARDS[a]

Pollutant	Averaging Time	Primary	Secondary
Carbon Monoxide	1 - hour 8 - hour	9 ppm 35 ppm	same as primary same as primary
Lead	90 - day	1.5 ug/m^3	same as primary
Nitrogen Oxide	Annual	0.05 ppm (100 ug/m^3)	same as primary
Ozone	1 - hour	0.12 ppm (240 ug/m^3)	0.08 ppm (160 ug/m^3)
Sulfur Dioxide	3 - hour 24 - hour Annual	0.5 ppm (1,300 ug/m^3) 0.14 ppm (365 ug/m^3) 0.03 ppm (80 ug/m^3)	- - -
Total Suspended Particulates	24 - hour Annual	260 ug/m^3 75[b] ug/m^3	150 ug/m^3 60[b] ug/m^3

[a] All long-term standards (i.e., greater than 30 days) are not to be exceeded. Unless otherwise noted, all short-term standards (i.e., 1-, 8-, and 24-hour) are not to be exceeded more than once per year. Unless otherwise noted, all averages are computed on an arithmetic basis.

[b] Geometric average, the secondary value is a guideline.

Table 3-8. MAMMALS KNOWN OR EXPECTED TO OCCUR IN THE GENERAL VICINITY OF THE SPOKANE RESERVATION.

COMMON NAME	SCIENTIFIC NAME
Order Insectivora	
Masked Shrew	Sorex cinereus
Merriam's Shrew	Sorex merriami
Vagrant Shrew	Sorex vagrans
Water Shrew	Sorex palustris
Pygmy Shrew	Microsorex hoyi
Order Chiroptera	
Little Brown Myotis	Myotis lucifugus
Yuma Myotis	Myotis yumanensis
Long-eared Myotis	Myotis evotis
Fringed Myotis	Myotis thysanodes
Long-legged Myotis	Myotis volans
California Myotis	Myotis californicus
Small-footed Myotis	Myotis subulatus
Silver-haired Bat	Lasionycteus noctivagans
Big brown Bat	Eptesicus fuscus
Hoary Bat	Nycteris cinerea
Townsend's Big-eared Bat	Plecotus townsendi
Pallid Bat	Antrozous pallidus
Order Lagomorpha	
Nuttall's Cottontail	Sylvilagus nutalli
Snowshoe Hare	Lepus americanus
White-tailed Jackrabbit	Lepus townsendii
Order Rodentia	
Yellow-pine Chipmunk	Eutamias amoenus
Red-tailed Chipmunk	Eutamias ruficaudus
Yellow-bellied Marmot	Marmota flaviventris
Red Squirrel	Tamiasciurus hudsonicus
Northern Flying Squirrel	Glaucomys sabrinus
Northern Pocket Gopher	Thomomys talpoides
Great Basin Pocket Mouse	Perognathus parvus
Beaver	Castor canadensis
Western Harvest Mouse	Reithrodontomys megalotis
Deer Mouse	Peromyscus maniculatus
Bushy-tailed Wood Rat	Neotoma cinerea

Table 3-8 (Continued)

COMMON NAME	SCIENTIFIC NAME
Gapper's Redback Vole	Clethrionomys gapperi
Heather Vole	Phenacomys intermedius
Meadow Vole	Microtus pennsylvanicus
Montane Vole	Microtus montanus
Long-tailed Vole	Microtus longicaudus
Richardson Vole	Microtus richardsoni
Muskrat	Ondatra zibethicus
House Mouse	Mus musculus
Western Jumping Mouse	Zapus princeps
Porcupine	Erethizon dorsatum
Order Carnivora	
Coyote	Canis latrans
Gray Wolf	Canis lupus
Red Fox	Vulpes vulpes
Black Bear	Ursus americanus
Raccoon	Procyon lotor
Marten	Martes americana
Fisher	Martes pennanti
Ermine	Mustela erminea
Long-tail Weasel	Mustela frenata
Mink	Mustela vison
Wolverine	Gulo luscus
Badger	Taxidea taxus
Striped Skunk	Mephitis mephitis
River Otter	Lutra canadensis
Mountain Lion (Cougar)	Felis concolor
Bobcat	Lynx rufus
Order Artiodactyla	
Elk	Cervus elaphus
Mule Deer	Odocoileus hemionus
White-tailed Deer	Odocoileus virginianus
Moose	Alces alces

Source: Dames and Moore (1974); Hall (1981)

3.3.3 Birds

Bird species whose geographic range overlap the reservation are listed in Appendix E.

The area offers good habitat for a variety of bird species. Habitat features associated with major drainages are adequate to support nesting species of raptors, including redtailed hawk and golden eagle. Other common raptors include kestrel, sharp-shinned hawk, Cooper's hawk, goshawk and Great horned owl.

The most common upland game species on the reservation is probably the ruffed grouse. The nearby Huckleberry Mountain Management Area has good populations of ruffed grouse (Zender, 1984). Blue grouse are more prevalent in open areas of the ponderosa pine/ Douglas fir habitat and populations are probably low near rivers. Other upland game species present are ringed-neck pheasant, Chinese pheasant, Merriam's turkey, Hungarian partridge, mourning dove and California quail. Chukar may also be present in small numbers on the reservation (Zender, 1984).

Waterfowl and shorebirds utilize the waters of the reservation. Major bodies of water in the area are FDR Lake and the Spokane River, which is a tributary of Columbia River and an arm of FDR Lake. Principal resident waterfowl on the reservation probably include mallard, golden-eye, pintail, widgeon, green-winged teal, blue- winged teal, cinnamon teal, wood duck, redheads, scaup and ring-billed gull. Canada geese and swan probably include killdeer, common snipe, spotted sandpiper, least sandpiper, western sandpiper, Wilson's phalarope, ring-billed gull and black tern.

3.3.4 Reptiles and Amphibians

A list of reptiles and amphibians whose geographic ranges overlap the reservation is presented in table 3-9.

Surface waters scattered throughout the reservation provide good habitat for amphibian and reptile populations. These areas are known to have more abundant and diverse populations of amphibians and reptiles than do the coniferous forest and open shrublands in the Sherwood project site (BIA,n.d.). Common amphibian species probably includes the Pacific tree frog, spotted frog and bullfrog. Major species of reptile on the reservation are probably the painted turtle, garter snake and gopher snake.

Table 3-9. AMPHIBIANS AND REPTILES WHICH ARE KNOWN OR EXPECTED TO OCCUR ON THE SPOKANE RESERVATION

COMMON NAME	SCIENTIFIC NAME
Class Reptilia	
Painted Turtle	Chrysemys picta
Western Skink	Eumeces skiltonianus
Rubber Boa	Charina bottae
Racer	Coluber constrictor
Gopher Snake	Pituophis melanoleucus
Western Terrestrial Garter Snake	Thamnophis elegans
Common Garter Snake	Thamnophis sirtalis
Western Rattlesnake	Crotalus viridis
Class Amphibia	
Long-toed Salamander	Ambystoma macrodactylum
Tiger Salamander	Ambystoma tigrinum
Western Toad	Bufo boreas
Pacific Tree Frog	Hyla regilla
Bullfrog	Rana catesbeiana
Spotted Frog	Rana pretiosa

Source: Nussbaum, Brodie and Storm (1983); Dames and Moore (1974)

3.3.5 Fisheries

The status of fisheries on the reservation is largely unknown. Information on fish species composition in the Columbia and Spokane rivers does not exist (BIA, 1976). A list of representative fish species on the reservation is presented in table 3-10. The Washington Department of Game and Fish has been stocking lakes and ponds on the reservation for over 20 years (Johns, 1984). Table 3-11 indicates the types and numbers of fish stocked in the waters on the reservation since 1980. Species stocked are primarily rainbow trout and eastern brook trout.

3.3.6 Threatened and Endangered Species

The Endangered Species Act of 1973 (Public Law 93-205) provides for the protection of endangered and threatened species, not only true species, but subspecies and distinct populations thereof. The act establishes two groups of protected species: an endangered species is "any species which is in danger of extinction throughout all or a significant portion of its range"; a threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Washington's threatened and endangered categories are very similar to the federal classification. An endangered species is a species "seriously threatened with extirpation throughout all or a significant portion of its range within Washington"; a threatened

Table 3-10. REPRESENTATIVE FISH SPECIES OF THE SPOKANE RESERVATION

COMMON NAME	SCIENTIFIC NAME
White Sturgeon	Acipenser transmontanus
Lake Whitefish	Coregonus clupeaformis
Coho Salmon *	Oncorhynchus kisutch
Sockeye Salmon (kokanee) *	Oncorhynchus nerka
Mountain Whitefish	Prosopium williamsoni
Rainbow Trout	Salmo gairdneri
Eastern Brook Trout	Salvelinus sp.
Brown Trout	Salmo trutta
Chiselmouth	Acrocheilus alutaceus
Carp	Cyprinus carpio
Peamouth	Mylocheilus caurinus
Northern Squawfish	Ptychocheilus oregonensis
Dace	Rhinichthys sp.
Largescale Sucker	Catostomus macrocheilus
Sucker	Catostomus sp.
Black Bullhead	Ictalurus melas
Burbot	Lota lota
Pumpkinseed	Lepomis gibbesus
Largemouth Bass	Micropterus salmoides
Black Crappie	Pomoxis nigromaculatus
Yellow Perch	Perca flavescens
Walleye	Stizostedion vitreum vitreum
Sculpin	Cottus sp.

* planted but possibly not established

Source: Dames and Moore (1974)

Table 3-11. STOCKING DATA OF SPOKANE RESERVATION WATERS.

YEAR	FISH SPECIES STOCKED	STOCKING LOCATION: GALBREATH	BC Mill	TURTLELAKE	BENJAMIN	MCCOY
1980	Rainbow Trout	1,000		4,015	4,015	
	Eastern Brook Trout	585				10,050F*
1981	Rainbow Trout	1,503	504	4,000	4,000	
	Eastern Brook Trout	315				10,680F
1982	Rainbow Trout	715	132	4,012	4,012	5,003
	Eastern Brook Trout	220	435			3,005
		(plus 10,000F)				(plus 10,430F)
1983	Rainbow Trout	1,080	540	6,075	6,075	
	Eastern Brook Trout	1,000				3,000
						(plus 10,500F)

* F = fingerlings; all other numbers represent legal or catchable fish stocked.
Source: Johns (1984); Albert (1984)

species is "not presently endangered but could become so in the foreseeable future" (Washington Department of Game, n.d.). All species federally classified as federally endangered or threatened are protected by Washington state law.

There are five vertebrate species listed as federally and/or state endangered whose geographic ranges overlap the reservation. they are the American white pelican, peregrine falcon, sandhill crane, upland sandpiper and wolf. Information presented on these species is largely from "Washington's Threatened and Endangered Wildlife" (Washington Department of Game, n.d.).

* The white pelican, classified as state endangered, occurs in Washington as a spring and fall migrant, primarily east of the Cascade Mountains, and as a summer resident in the Columbia Basin. Historically, this species bred regularly on Moses Lake and on several other lakes in eastern Washington. Loss of breeding habitat, as a result of land reclamation and irrigation projects, is thought to be the major reason for the decline of the white pelican in Washington.
* The pergrine falcon is listed as federally and state endangered. In Washington, there are three subspecies of the peregrine falcon: the Arctic peregrine stops over in Washington during migration to and from its wintering area; the Peale's peregrine (state endangered) is limited to marine habitat in Washington, British Columbia and Alaska; the American peregrine (federally endangered), once found

throughout North America, is largely confined to the western states and provinces. They nest on cliffs, particularly along the ocean and less commonly inland; along the coast, they forage over adjacent tideflats and beaches and, in the interior, over marshes and prairies (Larrison, 1981). Their decline is primarily related to the use of pesticides.

* The sandhill crane, classified as state endangered, concentrates in central Washington during migration, with smaller flocks migrating along both sides of the Cascade Mountains. Basic habitat requirements of the sandhill crane include large areas of shallow water, nesting cover, feeding pasture and isolation from human disturbance. Destruction of habitat, such as swamp drainage and prairie cultivation, is the main reason for decline in sandhill crane populations. Also, other human disturbances, such as illegal shooting, threaten this species.
* The upland sandpiper is listed as state endangered. The habitats of this species include prairies, grassy uplands and open bogs. Only one breeding site is known, in Spokane, and this site is threatened by development. Agricultural practices and commercial development have eliminated most of its habitat.
* The wolf is classified as federally and state endangered. This species is occasionally sighted in the Selkirk and Cascade mountains. Their decline is largely due to conversion

of habitat to farms and logging areas and to predator control practiced by early settlers.

Two species, the bald eagle and the ferruginous hawk, are listed as threatened species. The bald eagle breeds primarily west of the Cascade Mountains and winters along major rivers and coastlines throughout the state. Some of the reasons the bald eagle is threatened are illegal shooting, use of pesticides and destruction of habitat. The ferruginous hawk nests east of the Cascades and prefers habitat consisting of flat, arid, sagebrush country with occasional rock outcrops or scattered trees.

In addition to the threatened and endangered species, some species have been assigned special species status by the state (Washington Department of Game, 1983). Special species categories include Proposed Endangered (proposed for State Endangered classification), Proposed Threatened (proposed for State Threatened classification), Sensitive Species ("a species that could become threatened if current water, land, and environmental practices continue"), Proposed Sensitive (proposed for State Sensitive classification), Monitor Species ("species of special interest because they: have significant popular appeal; require limited habitat during some portion of their life cycle; are indicators of environmental quality; require further field investigations to determine population status; have unresolved toxonomic problems which may bear upon status classification; or were justifiably removed from endangered, threatened, or sensitive classification") and Proposed Monitor (proposed for State Monitor classification). Species with special species status that are known or expected to occur on the reservation are listed below.

* Proposed Threatened: Townsend's big-eared bat.
* Proposed Sensitive: Merriam's shrew, Long-eared myotis, pallid bat, whitetailed jackrabbit, marten, wolverine, horned grebe, trumpeter swan, goshawk, Swainson's hawk, golden eagle, gyrfalcon, prairie falcon, merlin, flammulated owl, burrowing owl, gray owl, pileated woodpecker, downy woodpecker, northern three-toed woodpecker, ash-throated flycatcher, sage thrasher, loggerhead shrike and grasshopper sparrow.
* Proposed Monitor: Yuma myotis, fringed myotis, long-legged myotis, smallfooted myotis, red-tailed chipmunk, western grebe, great blue heron, turkey vulture, long-billed curlew, Forster's tern, caspian tern, snowy owl, black-backed three-toed woodpecker, western bluebird and tiger salamander.

3.4 VEGETATION

3.4.1 Coniferous Forest.

The vegetation on the reservation is largely coniferous forest, varying from relatively moist fir forest to stands of ponderosa pine on drier sites.

Stands of ponderosa pine (also known as western yellow pine) are generally located on southern slopes at the lower elevations of the coniferous forest, with a predominantly grass understory

(Zender, 1984). They usually occupy drier sites than other forest types (Franklin and Dyrness, 1973). Common grass species include bluebunch wheatgrass, beardless wheatgrass, Idaho fescue, neddlegrass, needle-and-thread, prairie junegrass, sandberg bluegrass, rough fescue, red three-awn and pinegrass (Soil Conservation Service, 1981). Principal shrubs noted by the Soil Conservation Service are rose, common snowberry, snowbrush ceanothus, redstem ceanothus, spirea and serviceberry. In the sherwood mine and mill lease area, located in the southwestern part of the reservation, bitter brush is the dominant understory species, with an herbaceous cover consisting mostly of grass species (Dames and Moore, 1974). Daubenmire and Daubenmire (1968) include this ponderosa pine/bitterbrush association in the pine-grass group; they found that much of this area has been heavily grazed and used extensively for logging and crops, activities which may have contributed to deteriorated range conditions.

Forb species in the ponderosa pine forest may include common yarrow, eriogonum, lupine and arrowleaf balsamroot. Other tree species sometimes found in association with ponderosa pine stands are quaking aspen, lodgepole pine, western larch, grand fir and Douglas fir, which are usually restricted to specific habitat types within the ponderosa pine forest. For example, pure stands of lodgepole pine are widely distributed throughout forested areas of eastern Washington (Franklin and Dyrness 1973). The majority of these stands have developed after fire or logging. Also, aspen groves occur in riparian areas throughout the ponderosa pine forest (Franklin and Dyrness, 1973). Douglas fir, lodgepole pine, western larch and grand fir can be found at higher elevations on moist sites throughout the ponderosa pine forest.

The fir forest generally classified as a closed canopy coniferous forest is commonly located on moist sites on north-facing slopes and consists primarily of Douglas fir and grand (or white) fir. Other common tree species include lodgepole pine, western larch and ponderosa pine. Many other species, such as Englemann spruce, subalpine fir, sugar pine, western white pine, red cedar, mountain hemlock and red fir are probably present in limited numbers or in specific habitat types. Common snowberry, creambush oceanspray, spirea, rose, kinnikinnick, strawberry, huckleberry, mallow nine bark, pachystima and currant are characteristic shrub species found in the fir forest. The most dominate herbaceous understory species is probably pinegrass. Other common herbaceous (both forb and grass) species include lupine, violet, wild ginger, piper anemone, trail plant, penstemon, elk sedge, Idaho fescue, needle-and-thread and broadleaf arnica.

3.4.2 Shrubland and Grassland

Open areas found on the driest sites in the area include grass and bitterbrush-grass communities (BIA, 1976). The dominant species found in this vegetation type is bitterbrush, with an understory ground cover of yellow salsify, tufted phlox, autumn willow herb, snow buckwheat, tumbleweed, annual brome grasses, needlegrass, prairie Junegrass, yarrow, rabbitbrush, bluegrass and fescue. In small depressions, small patches of Columbia Hawthorne are found, and scattered ponderosa pine is found on hillsides.

Subshrubs, primarily rabbitbrush, buckwheat and velvet lupine, are scattered among a sparse to moderate cover of grasses and forbs on large, open plateaus (BIA 1976). These herbaceous species include bluegrass, fescue, prairie Junegrass, brome, wheatgrass, yarrow, arrowleaf balsamroot, cut-leaf daisy and Indian wheat. Some of these open areas have been converted to agricultural lands to cultivate alfalfa for cattle feed (BIA, 1976).

3.4.3 Riparian and Marsh

The riparian areas on the reservation generally consist of hardwood tree species. Mountain alder, willow, aspen, cottonwood and limited amounts of hawthorne are found on moist sites, generally located on north slopes. On southern slopes, aspen, cottonwood, willow, dogwood and hawthorne in greater numbers occur (Zender, 1984). Mountain alder and dogwood are usually found along perennial streams. Shrub species in this habitat type include common snowberry, pearhip rose, squaw currant, serviceberry, mock orange, mallow ninebark, Oregon grape, spirea, thimbleberry, Douglas' maple, chokecherry, strawberry and kinnikinnick (BIA, 1976. Marsh vegetation is found around small lakes and ponds and probably consists of cattails and rushes.

3.5 SOILS

The soils of the Spokane Reservation are located in the Northern Rocky Mountains Major Land Resource Area (USDA, 1981). These soils are found on mountains, foothills, terraces and flood plains. The soils are found on mountains, foothills, terraces and flood plains. The soils are mostly very deep, although the soils on mountains are moderately deep and well-drained. The mean annual soil temperature ranges between 0°and 8°C.

The Soil Conservation Service has surveyed the reservation soils (USDA, 1982). Soil descriptions presented here were obtained from this document. Appendix F lists the individual soils with pH ranges at various depths; the soils are mapped by associations in figure 3-6. The soils are described as follows.

* Spokane-Moscow-Rock Outcrop Association. These soils are moderately deep, well-drained and nearly level to very steep. Drainageways are deeply dissected. The soil parent material was mostly weathered granite, loess, volcanic ash and rock outcrops. These soils are in the mountainous areas, mostly in the southcentral and northcentral parts of the reservation. They are found on rounded ridgetops and smooth mountain toe slopes, foot slopes and side slopes at elevations from 1,800 to 4,000 ft. Land use is mainly for grazing of woodland areas; suitable lands are used for cropping and homesite development. Other land uses are wildlife habitat, water management and recreation. Spokane soils are found on slopes with southern aspects and on ridgetops. The surface soil

layer is loam, covered with a mat of partially decomposed organic litter. The subsoil is a gravelly sandy loam; weathered granite is at depths of 20 to 40 in. Moscow soils are similar to Spokane soils, but are on north-facing slopes. They also have a surface soil layer of very fine sandy loam, and the subsoil is silt loam underlain by sandy loam. Rock outcrops are exposed granite.

* <u>Huckleberry-Raisio-Hartill Association</u>. These soils are similar to the Spokane-Moscow-Rock Outcrop soils in location, depth, drainage, topography and slope characteristics. However, the soils in this association were formed in weathered shale rather than granite. These soils have a layer of partially decomposed organic litter, and phyllite material is below the soils. They are found in the same elevations and higher, up to 6,000 ft. Huckleberry soils are on north-facing slopes. They are formed in residuum weathered from shaly rock and are mantled with volcanic ash and loess. The surface soils and subsoil are silt loams. Raisio soils are south-facing and are formed in residuum weathered from shaly rock that is modified in places by glacial till and volcanic ash. The surface soils are shaly loam over a very flaggy loam subsoil. Hartill soils are mainly north-facing, at elevations of 2,000 to 3,000 ft. They are formed in colluvium and residuum weathered from shaly rock and are mantled with volcanic ash. They very fine sandy loam surface soil is

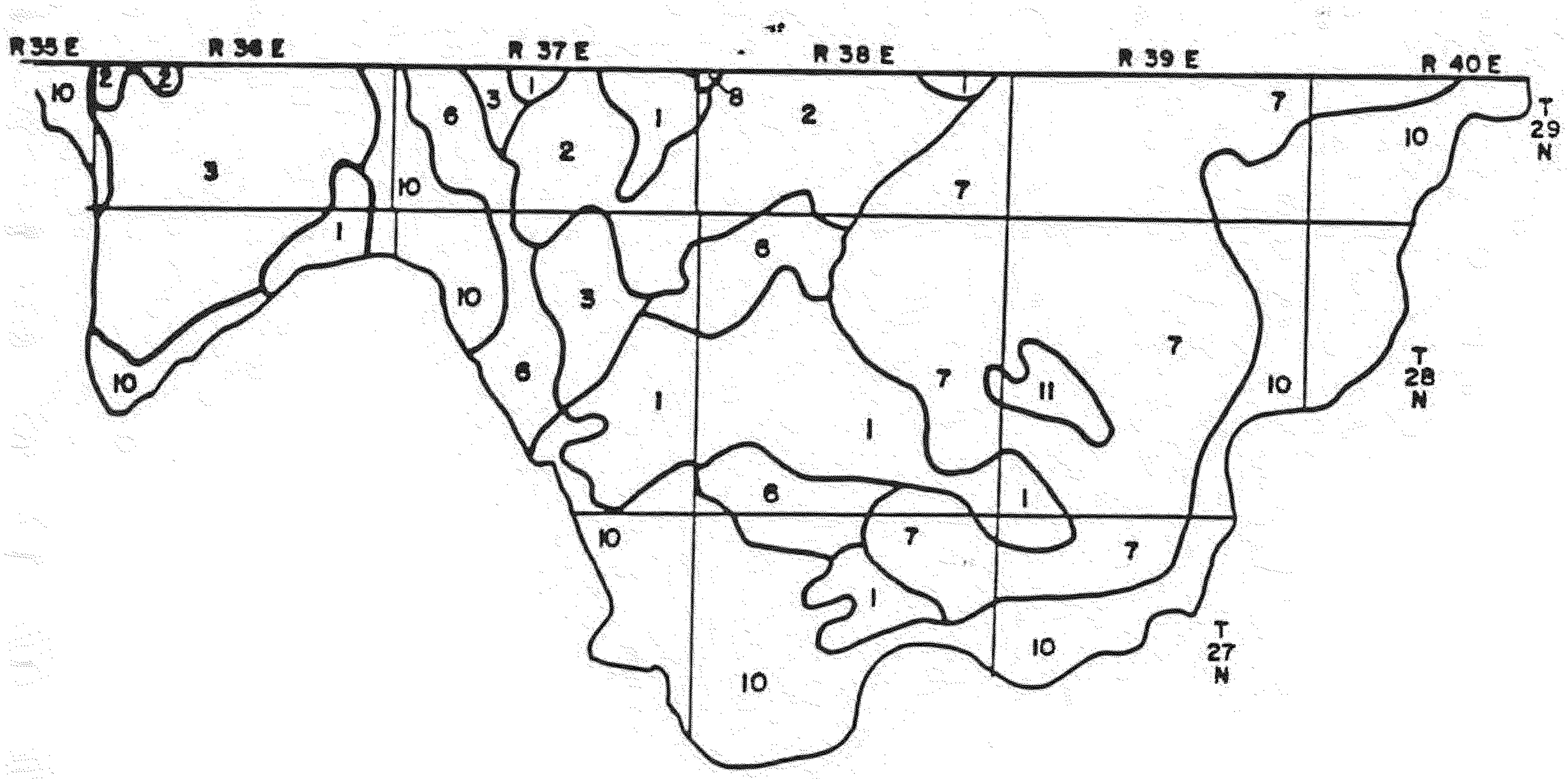


Figure 3-6. SOIL ASSOCIATIONS OF THE SPOKANE RESERVATION

Legend

Soil Associations

1. Spokane-Moscow - Rock Outcrop
2. Huckleberry - Raisio-Hartill
3. Aits-Newbell-Donovan
6. Stevens-Rock Outcrop
7. Bernhill-Green Bluff- Dearyton
8. Clayton-Cedonia - Martella
10. Springdale - Spens - Bisbee
11. Colville-Peone-Narcisse

underlain by a silt loam.

* Aits-Newbell-Donovan Association. These very deep soils are found on foothills with slopes from nearly level to very steep. They are formed in mixed glacial till, with a mantle or admixture of volcanic ash and loess. These well-drained soils are covered with a mat of partially decomposed organic letter. The land use is mainly for grazing of woodlands; other uses are for recreation, wildlife, watershed, homesite development and nonirrigated cropland. The elevation ranges from 2,000 to 5,000 ft. Aits soils are well-drained soils on toe slopes and side slopes of foothills. Newbell and Donovan soils are similar to Aits soils. However, Newbell soils were derived from weathered granite and their surface soil and subsoil are silt loam, and Donovan soils have a surface layer that is loam in the upper part and gravelly loam in the lower part.

* Stevens-Rock Outcrop - Dragoon Association. These nearly level to very steep soils occur on foothills along the Columbia and Spokane rivers and in alpine meadows at elevations ranging from 1,700 to 3,000 ft. The soils are moderately deep to very deep and well-drained. They are formed in residuum from granite and glacial till and rock outcrop. Land use for these sites occurring in woodland areas is mainly grazing land; some areas are used for nonirrigated and irrigated cropland. Other uses are recreation, rangeland,

watershed, wildlife habitat and homesite development. Stevens soils are on south-facing slopes and on ridgetops of foothills. They are very deep and well-drained and are formed in mixed glacial till with mixed loess and volcanic ash. The surface soil layer is silt loam and is underlain by a gravelly loam layer. Rock Outcrop are outcrops of granite, argillite, quartzite, limestone and phyllite. Dragoon soils are nearly level to steep, moderately deep and well-drained soils on foothill slopes. They are formed in residuum weathered from granite with mixed loess and volcanic ash. The surface soil is silt loam underlain by a clay loam subsoil, and beneath this is weathered granite.

* Bernhill-Green Bluff-Dearyton Association. The association is similar to the Aits-Newbell-Donovan association. these soils are found on foothills and basalt plateaus, and range in elevation from 1,800 to 3,000 ft. They are formed in glacial till and are mantled with volcanic ash and loess. The surface layer is silt loam; the subsoil is gravelly loam. The land uses are the same as those of the previously mentioned association. Green Bluff soils are nearly level to strongly sloping on basalt plateaus. Soil, beneath a layer of matted partially decomposed organic litter, is very fine sandy loam; the subsoil is silt loam. Dearyton soils are nearly level to steep on toe slopes of basalt plateaus and foothills. They are moderately well-dranined. The surface layer and upper

part of the subsoil are are silt loam, over a loam subsurface layer.

* <u>Clayton - Cedonia - Martella Association</u>. These soils occur to a very limited degree on the northcentral border of the reservation. These are very deep soils located along terraces and terrace escarpments of main drainageways. They are well-drained to moderately well-drained, nearly level to very steep soils formed in lake sediment and glaciofluvial material. The elevations range from 1,400 to 3,000 ft. The main land use is grazing of woodlands and for nonirrigated and irrigated cropland; other uses are for recreation, homesite development, watershed and wildlife habitat. Clayton soils are well-drained soils that are nearly level to strongly sloping. They are formed in mixed glociofluvial material. The surface soil, of very fine sandy loam, is overlain by a mat of partially decayed organic litter; the subsoil is fine sandy loam. On terraces, Cedonia soils are nearly level to moderately steep; steep to very steep soils occur on terrace escarpments. These well-drained silt loams are formed in glacial lake sediment and are mantled with volcanic ash and loess. Martella soils are moderately well-drained soils that are nearly level to steep. They formed in glacial lake sediment and are mantled with volcanic ash and loess. The surface soils, of very fine sandy loam, are overlain by a matted layer of partially decayed organic

litter. The subsoil has an upper part of silt loam and a lower part of silt loam and silty clay loam.

* Springdale-Spens-Bisbee Association. These soils are on terraces and terrace escarpments near the Columbia River, Spokane River and Chamokane Creek. They are somewhat excessively-drained soils formed in glacial outwash. The elevation ranges from 1,400 to 2,300 ft; the tribal farm is located in these soils. In other respects, these soils are similar to the previous association. Springdale soils are nearly level to strongly sloping and were formed in glacial outwash with an admixture of volcanic ash and loess. The surface soil, of gravelly sandy loam, is covered with a mat of partially decayed organic litter. The Subsoil has an upper layer of gravelly sandy loam and a lower layer of very gravelly loamy coarse sand and extremely cobbly coarse sand. Moderately steep to very steep Spens soils occur on terrace escarpments. These soils are formed in wind worked mixed sandy outwash material. The surface soil, of loamy fine sand, is covered with a matted, partially decomposed organic material and is underlain by loamy fine sand and sand.

* Colville-Peone-Narcisse Association. These soils make up a small percentage of the reservation. They are all very deep and nearly level and are found on bottom lands, flood plains, alluvial fans, perimeters of lakes and in depressional areas. A good example of these soils is located near Wellpinit. The

soils are formed in mixed alluvium and alluvium from volcanic ash and are moderately well-drained to poorly drained. Colville soils are on bottom lands that formed in mixed alluvium. The surface soil, of silt loam, is underlain by silty clay loam. Narcisse soils are on bottom lands and in depressional areas. These moderately well-drained soils are formed in mixed alluvium. The surface soil, of silt loam, is underlain by a loam subsoil. Poorly drained Peone souls are on flood plains, in depressional areas and on alluvial fans. They are formed in mixed alluvium, including volcanic ash and diatomite. The surface soil layer is silt loam, and the subsoil has an upper layer of silt loam and a lower layer of sandy loam.

3.6 HYDROLOGY

The waters of the arid West are a valuable resource required to sustain existing activities, as well as to provide for future growth and development. With increased development and environmental awareness has come the realization that the West's limited water resources need to be protected.

The Spokane Reservation of Washington has more than adequate amounts of good quality surface and groundwater supplies that could be developed. The freshwater resources of the Spokane Reservation are one of the most important resources the tribe has available to them. In order that this, presently underused and underdeveloped resource will be available in years to come, it must be protected from possible contamination and degradation. The Spokane Reservation, located within the Columbia River basin, is bounded on the west by the Columbia River arm of Franklin D. Roosevelt Lake (FDR Lake), on the south by the Spokane River arm of FDR Lake and on the east by Chamokane Creek, a tributary of the Spokane River. FDR Lake is the reservoir formed by the Grand Coulee Dam, downstream and to the west of the reservation. The lake extends 151 mi north and east up the Columbia River almost to the International Border and up to the Spokane River to within 37 mi of Spokane, Washington.

3.6.1 Surface Waters

The only major perennial river in the area is the Spokane River, the discharge of which is regulated by upstream dams and usage. The U. S. Geological Survey has established and maintains three stream gaging stations on or adjacent to the reservation on the Spokane River or its tributaries (figure 3-7). Table 3-12 summarizes the annual discharge of these rivers, as measured at these stations. Water quality data have been reported by the U. S. Geological Survey and U. S. Environmental Protection Agency for the Spokane River at Long Lake, Washington. (Appendix ~~B~~ shows that the waters are a calcium bicarbonate type and contain less than 100 mg/l of the total dissolved solids.) From west to east across the reservation the major tributaries of the Spokane River are: Orazada Creek, Sand Creek, Blue Creek, Little Chamokane Creek, 6,400 A-ft; Blue Creek, 3,660 A-ft; Little Chamokane Creek, 10,300

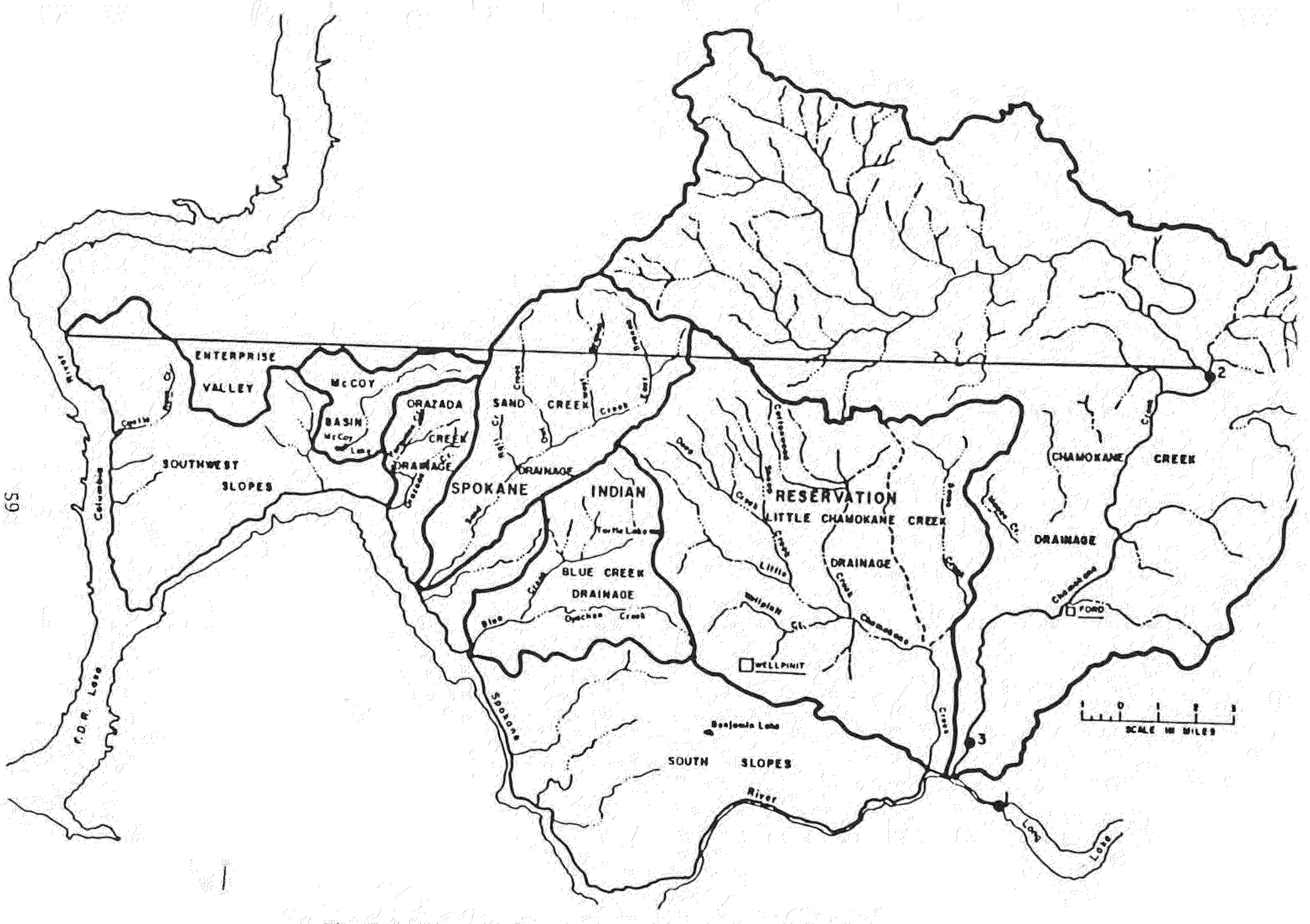


Figure 3-7. USGS GAGING STATIONS ON OR ADJACENT TO THE RESERVATION ON THE SPOKANE RIVER AND ITS TRIBUTARIES

Table 3-12. MEAN DAILY RIVER FLOWS (cfs) AT SITES OF THE SPOKANE RESERVATION

Spokane River at Long Lake Washington. Period of record: 4/1939-present

	Oct.	Nov.	Dec.	Jan.	Feb.	March
Min.	1868(1943)	2059(1940)	2341(1940)	2991(1940)	2118(1977)	3808(1977)
Max.	4327(1960)	9065(1960)	15820(1965)	23830(1974)	19500(1961)	27400(1972)

	April	May	June	July	August	Sept.
Min.	4206(1977)	5812(1977)	3932(1944)	1798(1977)	1356(1973)	14769(1963)
Max.	29410(1943)	33520(1948)	27480(1974)	7951(1950)	3178(1948)	3122(1960)

Chamokane Creek near Springdale, Wash. Period of record: 1973-1979

	Oct.	Nov.	Dec.	Jan.	Feb.	March
Min.	0(1973&79)	0(1973&79)	0(1973&79)	0(1973&79)	0(1973&79)	0(1973&79)
Max.	7.63(1976)	38.70(1974)	247(1974)	218(1974)	105(1974)	298(1974)

	April	May	June	July	August	Sept.
Min.	0(1973&79)	0(1973&79)	0(1979)	0(1979)	0(1979)	0(1979)
Max.	506(1975)	282(1975)	21.30(1975)	9.62(1975)	7.45(1976)	4.86(1975)

Chamokane Creek below falls near Long Lake, Wash. Period of record: 1971-79

	Oct.	Nov.	Dec.	Jan.	Feb.	March
Min.	0(1971&79)	0(1971&79)	0(1971&79)	0(1971&79)	0(1979)	0(1979)
Max.	40.30(1976)	47.50(1974)	236(1974)	221(1974)	154(1974)	351(1974)

	April	May	June	July	August	Sept.
Min.	0(1979)	0(1939)	0(1979)	0(1979)	0(1979)	0(1979)
Max.	564(1975)	257(1975)	67.90(1975)	45.90(1975)	41.40(1975)	39.10(1975)

A-ft. Woodward (1973) estimated the annual flow into McCoy Lake in the Orazada Creek drainage to 1,150 A-ft.

Chamokane Creek, the largest Spokane River tributary, represents 50% of the reservation waters. The creek flows through a fairly broad flood plain bordered on the west by plateau terrain. The plateau develops into mountainous terrain in the northcentral part of the reservation, which in turn gives way to steep rock bluffs and a series of terraces overlooking the Spokane River arm of FDR Lake in the southern part of the reservation (U. S. Bureau of Reclamation, 1975). Although water quality on the reservation is generally excellent, one exception has been noted. Previous studies at the Midnite Mine on the Spokane Reservation (CERT, 1980 and CERT, 1982) indicated seepage of leached contaminants from the mining activities into surface waters. Specifically, a yellow-white precipitate, containing a mixture of aluminum salt, gypsum and M_3O_8 was detected at the toe of a mine waste dump. This finding let to further monitoring, which demonstrated that elevated nitrate and ammonia levels exist in the surface waters of the area. The tribe is in the process of correcting this problem.

3.6.2 Groundwater

Groundwater is an important, though not fully defined, resource within the Spokane Reservation. The location, quantity, quality and recoverability of a groundwater resource are dependent upon the characteristics of the geologic formation that serves as the resource reservoir. The general geologic setting of the Spokane

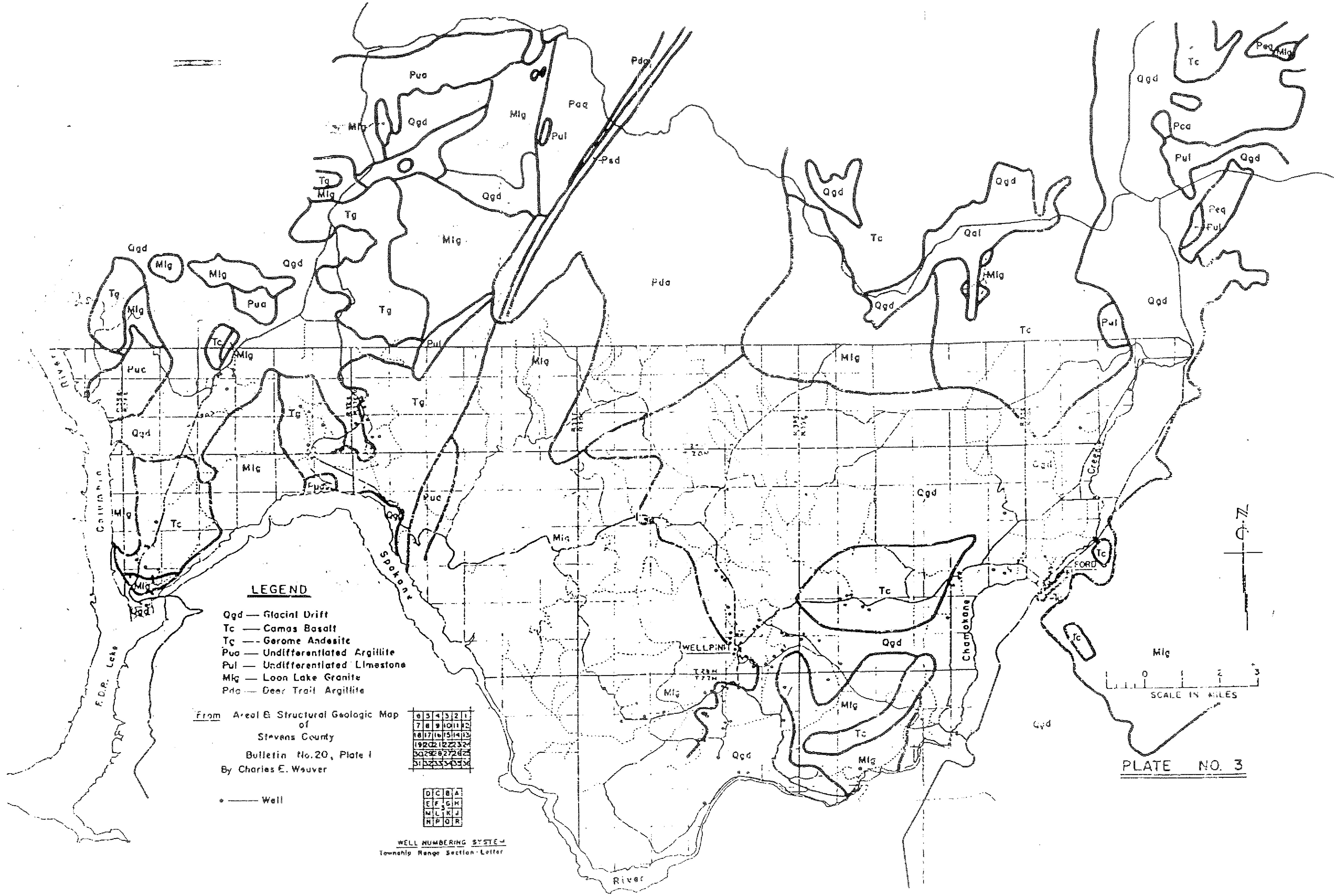


Figure 3-8. GEOLOGIC CONDITIONS AND MAJOR GROUNDWATER SOURCES OF THE SPOKANE RESERVATION

Reservation is summarized in a report by the U. S. Bureau of Reclamation (1975), which states:

> "The reservation lies in the southern part of the Okanogan Highlands physiographic division. Some of the earth's oldest rocks are exposed in the mountainous terrain of the Okanogan Highlands. These Precambrian metamorphic rocks include phyllite, quartzite, and dolomite. Paleozoic metasedimentary rocks overlie the older rocks at places. During Cretaceous time the area was intruded by a large mass of Loon Lake granite. Tertiary volcanic material then partially covered the older rocks. Large glacial deposits were distributed over much of the area during Pleistocene time. These glacial deposits form the extensive terraces that now border much of the Spokane River, the Columbia River, and the reservoirs on these rivers, including the project area. Considerable folding and some faulting have taken place in the older rocks."

Woodward (1973) has published the only comprehensive review of the hydrogeological conditions of the reservation. Based on Woodward's report and the geological conditions of the reservation as shown in figure 3-8, major groundwater sources of the reservation have been indentified. Fractured Loon Lake Granite, which underlies all of the reservation, is the principal bedrock aquifer of the reservation. While yields as great as 10 gpm have been reported from wells tapping this unit, the well yields (5-10 gpm) are generally adequate only for stock and domestic purposes.

Other rock units know to yield groundwater to wells on the reservation are Gerome Andesite, Camas Basalt and sand and gravel glacial deposits. Locally, those rocks may yield large quantities of water to wells, but, generally, the yields are only adequate for stock or domestic purposes. No information is available on the quality of the groundwaters found on the reservation. While the groundwaters should be of good quality, they should be checked for purity before any supply is used for domestic purposes.

Numerous springs are found throughout the reservation. In some instances, the discharge of these springs is quite large and accounts for a large part of the annual flow of the rivers. For example, Woodward (1973) noted that Chamokane Creek is dry during the summer months above Ford, Washington, while below Walker's Prairie, it is a live river, due to spring outflow. Woodward estimated that large capacity springs in this reach contribute 17,000 to 22,000 A-ft of water annually to the creek. This groundwater inflow accounts for approximately one-half of Chamokane Creek flow (Woodward, 1973).

3.7 EXISTING SOCIOECONOMIC CONDITIONS

3.7.1 Background

The Spokane Indians are part of the Salish Indian group which for centuries has lived in the area east of the Cascade Mountain Range. Traditionally members of a nomadic hunting and fishing culture, the tribe now has a limited land base, consisting of approximately 155,000 A in eastern Washington state. Of these acres, 104,000 belong to the tribe, 26,000 are owned by individual tribal members, 3,000 are under the control of federal agencies and 22,000 are owned by individuals not members of the tribe. This reservation, located at the confluence of the Columbia and Spokane rivers 50 mi northwest of the city of Spokane, represents a smaller land base than was originally established by presidential executive order in 1881. At that time 194,000 A were decreed to the Spokane Tribe.

Based on available information, the following is a summary analysis of social and economic conditions on and near the Spokane Reservation.

3.7.2 Population

In September of 1984, the Spokane Tribe commissioned a special census of the Spokane Reservation for the purposes of determining an accurate and up-to-date assessment of population, income, unemployment, and age. The Census was conducted by Opinion Research Laboratory of Seattle, Washington and has been certified by the state of Washington as accurate.

The total reservation population is 1,494 of this population 945 are tribal members, 244 are from other tribes and 296 are non-Indian.

3.7.3 Labor Force Characteristics

Data compiled in early 1984 indicates a reservation work force totalling 969 individuals, including 881 Indians; of that work force, 338 are employed on the reservation in the government (230) and private (108) sectors. This represents a considerable decline in the number of jobs on the reservation since 1980, when 717 were available, and is principally the result of a downturn in mining activity. In February 1984, 65% of the resident labor force on the reservation was unemployed, with only 250 of the 881 Indians in the work force actually working. Table 3-13 summarizes the total number of jobs on the reservation, by employer. As the data indicate, less than one-third of the jobs on the reservation are in the private sector.

3.7.4 Economic Base

The current high rate of unemployment, following the downturn in mining activity, reflects the extent to which the reservation economy has been dependent on the Western Nuclear Mine and the Dawn Mine. Besides the jobs at the mine, the tribe benefited directly as a result of mining activity in the form of royalties, which in 1979 exceeded $3 million. Other elements of the reservation economy include agriculture, through the tribal farm enterprise, and land leases, the forest products industry and tribal retail enterprises.

Table 3-14 reflects the regional economic character by identifying the number of employees in various private sector industries

Table 3-13. EMPLOYED WORK FORCE ON RESERVATION
AS OF FEBRUARY 15, 1984

EMPLOYER	TOTAL	INDIAN	NON-INDIAN
Spokane Tribe			
Tribal Government	57	53	4
Trading Post	6	6	0
Home Improvement	7	6	1
EWIC	23	23	1
Moyer Construction	4	3	1
Bureau of Indian Affairs	56	50	6
Indian Health Service	20	11	9
U.S. Postal Service	2	1	1
Wellpinit School District	40	11	29
Housing and Urban Development	8	8	0
Private Sector			
Western Nuclear, Inc.	79	59	20
Dawn Mining Co.	3	1	2
Galbraith's Store	7	4	3
Tribal Cafe	4	2	2
Little Squaw Smoke Shop	2	2	0
Kieffer's Store	1	1	0
Keiffer's Logging	7	4	3
Bair's Logging	7	4	3
D & B Radiator's	1	1	0
TOTAL EMPLOYED WORK FORCE	338		
TOTAL INDIAN PREFERENCE WORK FORCE		250	
TOTAL NON-INDIAN WORK FORCE			88

Source: The Spokane Tribe

within a five county area in 1981. Stevens County, which includes the Spokane Reservation, shows a high number of individuals involved in manufacturing (including lumber and wood products), mining, retail trade and services. With mining considered a base industry, its recent decline in the area has resulted in a decline in the number of people employed in that industry, as well as in other non basic sectors of the economy.

Spokane County data, which include the city of Spokane, reflect that city's role as a large regional center. Many people are employed in wholesale and retail trade, finance, insurance, real estate and other service-oriented positions. The other three employment categories are rural in nature, including agriculture, lumber and wood products.

3.7.5 Tribal Services

Most tribal services are provided by the tribal government and the Bureau of Indian Affairs (BIA). The tribal government consists of the tribal council, a general manager and a technical and support staff.

Table 3-14. NUMBER OF EMPLOYEES BY INDUSTRY

FIVE COUNTY REGION 1981

INDUSTRY	STEVENS COUNTY	SPOKANE COUNTY	FERRY LINCOLN PEND OREILLE COUNTIES	TOTAL
Agricultural Services, Forestry, Fisheries	0-19	267	0-57	267-343
Mining	404	268	100-249	627-821
Contract Construction	159	6771	59-78	6989-7008
Manufacturing (including lumber and wood products)	1929	17,713	966	20,608
Transportation and other Public Utilities	149	5477	58-137	5684-5763
Wholesale Trade	134	10,345	366	10,845
Retail Trade	989	23,860	747	25,596
Finance, Insurance, Real Estate	160	9047	150-229	9357-9436
Services	1572	29,508	290-369	31,370-31,449
Non-Classifiable Establishments	20-99	879	46-204	945-1182
TOTAL	5496-5594	104,135	2,782-3402	112,411-113,131

Source: County Business Patterns- Washington 1981, Bureau of Census, U. S. Department of Commerce.

The tribal government and staff perform the normal administrative duties of the tribe and operate a farm enterprise, a trading post and a home improvement program. A housing authority also exists to serve the needs of tribal members, and police protection is provided by the tribal government through a 96-638 contract with the BIA.

4.0 PSD PROGRAM DESCRIPTION FOR SPOKANE TRIBE

4.1 History

Through court initiated action, in 1974 the EPA promulgated regulations to prevent emissions of sulfur dioxide (SO_2) and total suspended particulate (TSP) from significantly deteriorating air quality in those parts of the country where concentrations of these pollutants were below the National Ambient Air Quality Standards (NAAQS) for SO_2 and TSP. The PSD regulations prohibited the construction and operation of certain new or modified emission sources without a determination by the EPA (or its delegated authority) that the source would (1) not cause ambient air quality levels which would significantly deteriorate existing air quality and (2) use Best Available Control Technology (BACT).

In the 1977 Clean Air Act Amendments, the PSD requirements were modified (see Sections 160-169 of the 1977 Clean Air Act Amendments). These new requirements were more complex and, in some regards, more stringent than the previous requirements. Subsequently, in June 1978, the EPA promulgated a modified set of PSD regulations.

A number of environmental and industrial groups sued EPA over these regulations in the United States Court of Appeals for District of Columbia. In the legal decision of Alabama Power Company v. Costle in June 1979, the court upheld some of the regulations, but overturned others. Further, the court stayed the implementation of its court decision to enable the EPA to propose new regulations. In September 1979, the EPA proposed amendments to the PSD regulations in response to the court decision. In December 1979, the Court of Appeals, in a final opinion, reaffirmed its earlier decision. EPA has completed the new regulations that were proposed in September 1979.

4.2 Philosophy

Simply stated, the intent of the PSD program is to keep clean air areas of the country clean. Before the PSD concept was developed, the air quality control effort in this country was directed almost entirely toward clean-up of air pollution in polluted urban areas. PSD, on other hand, is directed to the clean portions of the country and attempts to prevent any further significant pollution of the air in those areas. PSD levels are much lower than those set to protect human health (i.e., NAAQS).

The purposes of the PSD program are identified in Section 160 of the 1977 Amendments and are:

* to protect public health;
* to preserve, protect and enhance certain areas of the country;
* to insure that economic growth will occur in a manner consistent with air quality goals;
* to protect intrastate interests; and
* to insure careful evaluation of all consequences and

assure informed public participation.

4.3 Affected Areas and Increments

There are three area classifications for PSD: Class I, Class II, Class III. Generally speaking, Class I is the designation for clean, pristine areas and would permit little or no development; Class II designation is for clean areas where a moderate amount of development would be permitted; and Class III is the designation for clean areas where a significant amount of development (up to the health standards) would be permitted.

Initial Designated Areas. In the 1977 Clean Air Act Amendments, an initial determination of PSD designated area was made. These designations are:

* Class I: International parks, all national wilderness areas over 5,000 A, all national memorial parks over 5,000 A, all national parks over 6,000 A;
* Class II: All other portions of the country which do not violate NAAQs (Health Standards);* and
* Class III: None.

Increments. Although the 1977 Clean Air Act Amendments indicate that all pollutants which have established NAAQS may be covered under PSD, to date only PSD standards for SO_2 and TSP have been set. The concept of these standards is increments. Increments are those ambient air concentrations produced by a source or a group of sources, irrespective of the existing background or baseline air quality in the region. Once the baseline is set, the

* All CERT tribal lands were therefore initially designated in 1977 as Class II areas.

contributions of emission sources are accumulated up to the standard. It may be seen that, by the use of increments, PSD fosters the policy of "first come, first Served" for new or modified emission sources. The maximum allowable increments over baseline are listed in table 4.1. The upper limit for these increments is the NAAQs for each pollutant.

Table 4.1 PSD INCREMENTS

Pollutant and Averaging Time	Maximum Allowable Increment Average (micrograms/cubic meter) Class I	Class II	Class III
Total Suspended Particulates			
Annual Geometric Mean	5	19	37
24-hour maximum	10	37	75
Sulfur Dioxide			
Annual Arithmetic Mean	2	20	40
24-hour maximum	5	91	182
3-hour maximum	25	512	700

4.4 Redesignation

Certain areas can be redesignated from their initial classification (see Section 164 of the 1977 Amendments). Of particular interest to tribes is the provision that states, "Lands within the exterior boundaries of reservations of federally recognized Indian tribes may be redesignated only be the appropriate Indian governing body." In order to redesignate, the following actions must be performed.

(1) Announce the intent to redesignate to the appropriate regional office of the EPA.

(2) Announce the intent to redesignate to the public in any area affected by the redesignation.

(3) Prepare a report which describes and analyzes the health, environmental, economic, social and energy effects of the redesignation.

(4) Schedule and hold public hearings in the area to be redesignated.

(5) Answer public comments and possibly revise report.

(6) Submit to EPA the revised report for its determination.

A number of tribes have expressed an interest in redesignating from Class II to Class I. To date, the Northern Cheyenne Tribe, the Salish-Kootenai (Flathead) and the Assiniboine and Sioux Tribes (Fort Peck) are the only tribes to request and obtain redesignation from Class II to Class I. Attachment A references the procedures and schedule that the Northern Cheyenne followed for their redesignation. Additionally, a general outline of their report, entitled "The Northern Cheyenne Air Quality Redesignation Report and Request," is presented in Attachment D.

Section 164 of the 1977 Clean Air Act Amendments also provides for the settlement of disputes between an Indian tribe and a state over any redesignation proposed by either the tribe or the state. In such a situation, the affected tribal reservation or state may request the EPA administrator enter into negotiations with the parties involved to resolve the dispute. If a resolution cannot be gained in the negotiations, the EPA will decide on a solution. this is generally the same approach used by the EPA to settle disputes among states.

4.5 Administration and Enforcement

The PSD program is administered under the auspices of the EPA through a permit system. Certain new sources or modifications to existing sources must demonstrate that they are in compliance with the appropriate PSD increment before a permit can be granted. The Clean Air Act provides for the delegation of PSD enforcement by EPA to local air pollution agencies through approved implementation plans. Although it is not directly mentioned in the Act, it seems that tribes could be eligible forms of government to receive this delegation to enforce their own PSD programs.

The Administration and enforcement of the PSD program is governed by regulations that EPA promulgates. Although recent circumstances will probably result in additional changes to the existing regulations, it is possible to outline the general requirements of the regulations (Table 4.3). Of particular note to the tribes is the recent exemption of mining operations from PSD requirements Also implied in table 4.2 are two important elements of the PSD program: (1) sources are granted permits on a first come, first served basis; after the increment is used up, no more sources, regardless of their merit, are allowed and (2) demonstration of PSD increment compliance is a time-consuming and very complex technical activity.

Table 4.2 SUMMARY OF PSD REGULATIONS

Type of Program:	Permit.
Enforcement Agency:	EPA or delegated authority.
Type of Compliance:	PDS Incremental Ambient Air Standards for different classes for sulfer dioxide and total suspended particulates.
Sources Affected:	Major stationary and/or modifications of stationary sources listed in the Clean Air Act. Fugitive emissions are exempt (i.e., mining operations are exempt).
Geographic:	Applies to all sources affecting an area.
Applicability:	These sources could be located within an area or adjacent to an area. However, sources located in non-attainment areas are exempt from the above.
Demonstration of Compliance:	Responsibility of the proponent to

demonstrate compliance with standards. This is done by collecting baseline air quality data for a period of at least one year and by performing air quality predictive modeling to estimate ultimate impact.

4.5 <u>Implications to Tribes</u>

The implications and effects of the federal PSD program on tribes could be significant. Although the focus of PSD is not necessarily on protecting human health, PSD is an air quality program oriented toward protecting clean areas of the country, such an Indian reservations, from further air quality degradation. Since Indian tribes are specifically given certain options under the legislation to designate what levels of PSD should be allowed, tribes can use the PSD program to pursue the following objectives.

* <u>Protect and preserve the air quality environment on reservation lands.</u> this is certainly the primary intent of the PSD program. The degree of protection desired by the tribe can be specified by either accepting the existing Class II designation or requesting a redesignation to Class I.
* <u>Protect and preserve cultural and religious elements on reservation lands.</u> Certain aspects of air quality degradation could interfere with the pursuit of necessary cultural or religious activities. If the Class II designation does not offer adequate protection, a redesignation to Class I may be

necessary.

* <u>Provide for oderly economic growth on reservation lands.</u> As a general rule, energy-related economic growth and air pollution are directly related. If any desired economic growth is associated with energy facility construction, either on or adjacent to the reservation, it was probably necessary for the tribes to maintain the Class II designation. On the other hand, if the tribe wishes to pursue its own energy development, but is concerned that non-tribal development off reservation lands would use up its PSD increment first, the tribe could request a redesignation to Class I to "bank" the increment for themselves at a later date. (It must be pointed out that this strategy could be risky and not entirely acceptable to EPA because it does not fit the intent of the PSD legislation).

* <u>Obtain a greater degree of self-determination for Indian tribes.</u> As indicated previously, PSD can be used by the tribes so that they can make their own decisions concerning air quality and, indirectly, energy development. Additionally, further control can be obtained by the tribe if authority to enforce and manage air quality programs is sought. If such a delegation were obtained by the tribes, the tribes could make decisions on siting of air pollution sources.

5.0 IMPACTS OF REDESIGNATION ON RESERVATION

The Spokane Tribe is considering several types of economic development options for the reservation. Possible initiatives include projects to expand agriculture and tourism. Such projects, when properly designed and operated, will have little effect on air quality. On the other hand, other economic initiatives may include a wood-fired boiler to heat and power a new manufacturing operation, which with dust controls could have a significant impact on reservation air quality. The scope of such an endeavor could be influenced by the PSD classification of the reservation. The two temporarily closed uranium mines on the reservation will also affect local air quality conditions if reopened.

5.1 Feedlot

Development of a feedlot in the southern area of the reservation may have a local effect on the dust concentrations and odors in the area. The lot would be designed for transition feeding which would last for two months per lot of cattle and would have a capacity of 1,000 head of cattle to be fattened on hay and silage. The air quality impacts are difficult to define due to widely varying feedlot designs and practices, but effects are generally limited to the area very near to the feedlot. These emissions are of dirt and dried manure from movement of cattle about the pens, ammonia from the urine and decomposition of manure, and odorous gases from decomposition of manure. Emissions are estimated (AP-42) at 280 lb of particulate per day and 11 lb ammonia per day. The results of the analysis are shown in table 4-1. The down wind impacts will be highest to the southwest of the lot, and concentrations decrease to about one third of the highest values at equal distances to the northwest and southeast. Highest impacts occur at the boundary and decrease with downwind distance. To the southwest, second-high 24 hour concentrations could be 68 ug/m^{3}at 400 meters downwind and decrease rapidly to 32 ug/m at one kilometer distance and 3.5 ug/m^3 at 5 kilometer distance. When large particle drop-out is considered the calculated concentrations decrease to about half or 16 and 1.7 mg/m^3 at 1 and 5 kilometers, respectively. These impacts are well below the federal standard of 150 ug/m^3. In accordance with current EPA regulations, such fugitive dust impacts are not considered in PSD analyses.

5.2 Tourism

The Spokane Tribe is considering further development of tourism in the scenic western portion of the reservation. The principal emissions from such activity would be vehicular exhaust and particulate matter from travel over unpaved roads. Diesel engine exhausts can be locally noxious as well as a source of fine particulates. With proper design and management, tourism development should not jeopardize the PSD increments for either particulate matter of sulfur dioxide. Appropriate practices can also minimize increases in concentrations of the principal vehicle emissions--carbon monoxide, nitrogen oxides and hydrocarbons.

Table 5.1 MAXIMUM PARTICULATE IMPACTS FROM EXISTING AND PROPOSED SOURCES ON THE SPOKANE RESERVATION (24-hour 2nd high concentrations in ug/m3)

Source	Location of Impact	Magnitude of Impact	Federal Secondary Standard
Slash burning	within 70km of fire	10	150
wood burning for heat	in Wellpinit	161	150
Feedlot	1km southwest of feedlot	32	150
	5km south of feedlot	3	150
mine	2km southwest of mine	81	150
	5km southwest of mine	31	150
wood-fired boiler	1km southwest of boiler	25	150
	5km southwest of boiler	7	150

5.3 Sawmill and wood treating facility

Consideration is being given to building a sawmill near the community of Ford in the eastern region of the reservation. For purposes of this review the sawmill is assumed to handle 10 million board-feet annually with an auxiliary pressure treatment system. No boiler or waste incinerator is envisioned. Such a facility would not have a significant impact on air quality in the region and would not be constrained by any PSD classification.

5.4 Sherwood Mine and Dawn Mine

The Sherwood and Dawn uranium mines on the reservation are currently inactive. If these open-pit mines are reopened, they may be significant sources of particulate matter. Both are open-pit mines which move a substantial amount of overburden and uranium ore by truck. The vehicular activity and material handling produce fugitive dust. The Sherwood mine also has an adjacent mill which would produce minor amounts of dust, some of which is radioactive. Mill emissions are not addressed herein, but can be found in the Sherwood environmental impact reports (BIA, 1976). If the mines were to be activated with a material movement rate in the range of 2,000,000 to 4,000,000 tons per year, and the haul roads were well- controlled for dusting, emissions would be about 400 tons per year from each. About half these emissions will be large particles which will fall out rapidly. The remaining 200 tons per year of particulate are of concern, and will travel longer distances downwind from each of these operations.

On a work schedule of 24 hours per day, 250 days per year, the daily emissions of fine-sized dust would be approximately 800 lb. Downwind impact spatial patterns are similar to those of the feedlot and the concentrations would be higher. Second highest 24-hour impacts from each of these operations would be 81 ug/m^3, two kilometers downwind and 31 ug/m^3 five kilometers downwind.

The effect of PSD reclassification on the reopening of these mines is highly dependent upon the nature of resumed mixing and milling activities. Regardless, a PSD Class I designation, if applied to mining, would be somewhat more limiting than the current Class II designation.

5.5 Uranium Mills

In addition to the reopening of the mines, the potential exists for the uranium mills to be reactivated. However, it is not possible to estimate specifically the magnitude of air quality impact of any mill activation at this time. In addition, the regulatory status of the mills in terms of being classified as existing sources or new sources is clouded. This would affect whether the mills would be considered a part of the baseline for PSD purposes or a new source which has to meet Class I or II increments.

Nevertheless, a generalized analysis of potential non-radiological* impacts from a generic mill can be performed. Using information on a typical 2,000 ton per day acid-leach uranium mill a maximum potential particulate rate of 2,390 lb/day is estimated (CERT, 1983). Most of these emissions result from the tailings piles. This emission rate would be greater than that of the feedlot or wood burning for heat, and comparable to the mine's emission rate.

Therefore, the renewed milling operations would constitute a major particulate source and, if subject to PSD review as a new

* Radiological impacts from both gaseous and particulate emissions can occur from mills (CERT, 1985 and BIA, 1976). These impacts are not part of EPA PSD requirements, and are therefore, not covered in this report. However, radiological impacts from mills should be an important consideration for future tribal uranium development plans.

source, could be affected by any PSD reclassification. Further analysis should be performed on any proposed milling operations.

5.6 Wood-Fired Boiler

The tribe has wood in the form of slash, sawdust and chips available from logging and perhaps sawmill. Depending upon the size of these operations, there may be up to 60,000 tons of wood per year available as boiler fuel. This wood has a heat value of about 720,000 MBTU per year. A boiler operation 24 hours per day, 250 days per year could operate at a design rate of 120 MMBTU heat consumption per your (which is a chip consumption of 10 tons per day). A hypothetical boiler used for this impact analysis has a stack height of 100 ft and no particulate control system.

The air quality impacts of particulate emissions are estimated to be 25 ug/m^3 as a medium 24-hour average at a downwind distance of one kilometer. At a distance of five kilometers the maximum 24-hour average would be 7 ug/m^3. The maximum concentration of 25 ug/m^3 would be allowable under the current Class II designation. However reclassification to Class I which establishes a maximum allowable increment of 10 ug/m^3 as a 24-hour average, would exceed the standard. Consequently an emissions control system would be required on the boiler described above or the facility could not be constructed.

6.0 EFFECT OF REDESIGNATION TO PSD CLASS I ON VEGETATION AND WILDLIFE

6.1 Overview

Important natural resources on the Spokane Reservation include vegetation and wildlife, and the natural soils, waters and air quality which support them. Both particulate matter and sulfur dioxide in the ambient air can threaten the lives of plants and mammals if present in sufficient concentrations. This discussion examines the sensitivity of vegetation (including crops) and wildlife found on the reservation to those concentrations of air pollutants regulated under Class I and Class II designations of the Prevention of Significant Deterioration (PSD) program. Table 2-1 presents the applicable allowable increases in concentration of particulate matter and sulfur dioxide (SO_2).

6.2 EFFECT OF PSD DESIGNATION ON SOILS AND VEGETATION

6.2.1 Soils

The characteristics of soils found on the Spokane Reservation are described in the Spokane Air Quality Analysis (1984), section 3.5. Major features are summarized in section 3.3 of this document. The integrated system of soils, surface waters and groundwater on the reservation has evolved to the natural balance which currently characterizes the area.

Increases in reactive compounds in the air may alter the acidity or alkalinity of precipitation and hence that of the receiving soils. Sulfur dioxide and nitrogen oxides are thought to be a contributor to acid rain or acid deposition, a major and growing concern in many areas of North America and Europe. The causes and effects of this complex phenomenon are widely debated.

Limiting concentrations of sulfur dioxide on the reservation by redesignation to Class I may have some effect on the acidity of rainfall. Any such effect would not be expected to affect rainfall on the reservation, but precipitation many miles away. The location of receiving soils would be dependent upon atmospheric chemistry and climatological conditions. Best available information indicates that soil characteristics on the reservation are unlikely to be affected by a Class I or Class II designation.

6.2.2 Vegetation

Plant life on the Spokane Reservation is an extremely valuable resource. The forested areas provide necessary habitat for wildlife and important raw material for the forest products industry. Croplands produce foodstuffs for both human and livestock consumption. Detailed descriptions of natural vegetation are presented in the Spokane Air Quality Analysis (1984), section 3.4, and are summarized in section 3.0 of this document.

A common plant on grasslands and shrublands in Junegrass. Damage to Junegrass has been observed when exposed to SO_2 concentration of 0.02 to 0.10 parts per million (ppm) over growing season (Dodd et al., 1978). The incremental increases in SO_2 concentration now permitted as a Class II area are 0.007 ppm-annual average, and 0.034 ppm-maximum 24-hour average. Under worst conditions some damage to this sensitive specie may occur under Class II limitations. Corresponding limitations under Class I designation, 0.0007 ppm-annual, and 0.002 ppm-24-hour, would protect Junegrass from any known effects.

Most natural vegetation found on the reservation is not known to be affected by low concentration of SO_2. Ponderosa pine, for example, is resistive to injury until subjected to SO at 1.0 ppm for a four-hour period (Evans et al., 1975). Injury to aspen, found in the riparian areas of the reservation, first appeared at an SO_2 concentration of 0.35 ppm for three hours.

Alfalfa is the principal crop produced on the Spokane Reservation lesser quantities of corn, wheat and barley. Alfalfa was identified in 1969 as one of the most sensitive plans of sulfur dioxide. A study by Tingey et al. (1975) indicated alfalfa damage due to SO_2 at 0.05 ppm for five days/week over five weeks. Reduced yields of wheat and barley were found at 0.15 ppm of SO_2 over the growing season (Wilhour et al., 1978). These concentrations are above the allowable increases in SO_2 concentrations in areas designated Class I or Class II.

Although a significant amount of scientific data suggest limited or no adverse impacts to the vegetation on the reservation at Class I or Class II PSD levels, outstanding questions still remain about the effects of long-term, low-level exposures of SO_2 and TSP.

More studies need to be performed before absolute relationships can be determined.

6.3 EFFECT OF PSD DESIGNATION ON FISH AND WILDLIFE

6.3.1 Fish

The freshwater resources on the Spokane Reservation including fisheries are important and should be protected. Information ofn local species of fish is limited as discussed in section 3.3. The impact of sulfur dioxide and particulate matter in the ambient air on surface waters is not well documented. Although not at issue in this analysis, the effects of increased acidity in precipitation have been found to vary widely with the hydrology and geology of receiving waters. It is not known whether a Class I or Class II designation will adversely affect fish on the reservation.

6.3.2 Mammals

The effects of particulate matter and sulfur dioxide on the health of mammals in the wild are not well understood. Some evidence suggests that other mammals may respond in a manner similar to humans. Respiratory impairment and other health effects have been attributed to both contaminants. All PSD increments (Classes I, II and III) are intended to assure protection from adverse health effects with an adequate margin of safety.

Reservation wildlife may also be affected by any changes in vegetation caused by air pollution. Many mammals are dependent upon plants for both food and shelter. Livestock is also dependent upon forage crops as food supply. Among the many vegetation species found on the Spokane Reservation, only Junegrass has been found to be sensitive to SO_2 in the ranges of Class I and Class II. Wildlife would be better protected under a Class I designation to the extent it is dependent on Junegrass and any other species with corresponding sensitivity to sulfur dioxide.

7.0 AIR QUALITY IMPACTS ANALYSIS

A preliminary predictive modeling analysis was conducted to determine potential air quality and visibility impacts to the Spokane Reservation due to operation of the principal air emission source in the general region, the proposed 2280 Mwe Creston Coal-fired electric power generating station (CGS). Primary emphasis was placed upon a preliminary evaluation of potential environmental impacts to the presently designated Class II air quality area encompassing the Spokane Reservation with respect to compliance with the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments. A brief synopsis on visibility is included.

7.1 PRELIMINARY AIR QUALITY DISPERSION MODELING ANALYSIS

7.1.1 Methodology

Perusal of the geographic region of interest, in terms of predictive air dispersion modeling techniques, dictates utilization of a complex terrain model, due to the irregular regional topographic features illustrated in map 1. Rather large surface elevational variations, extending from about 1,500 ft MSL to over 4,000 ft MSL, are evidence within the boundaries of the Spokane Reservation.

Although the Washington Water and Power Company has undertaken an extensive baseline environmental monitoring program in the immediate vicinity of the CGS site, entailing the measurement of pertinent climatological, meteorological and air quality parameters that are a requirement for the most sophisticated air quality dispersion models, these data compilations were not available to the CERT staff for utilization in this analysis. Consequently, all air quality dispersion modeling modeling screening analyses for this study were performed with the EPA VALLEY Model (Burt, 1977), utilizing both the rural, long-term (annual) and short-term (24-hr) complex terrain options of the program.

The long-term option of the model requires surface meteorological data in the STAR format, which entails relative frequency distributions of the sixteen cardinal compass wind directions (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SE, WSW, W, WNW, NW and NNW) as a function of six wind speed intervals (0-3 knots, 4-6 knots, 7-10 knots, 11-16 knots, 17-21 knots, and greater than 21 knots) for each of six Pasquill-Gifford stability categories (A, B, C, D, E, and F). the best available long-term STAR data compilations, represented by the 10-yr (1 January 1968 through 31 December 1977) normalized annual averages for the Spokane, Washington, National Weather Station (NWS) (included as Appendix D in this report), were used in the long-term VALLEY modeling analysis.

The short-term (24-hr) VALLEY <model complex terrain program option is also recommended by the EPA Office of Air Quality

Planning and Standards (OAQPS) Guideline on Air Quality Models (1981) in preliminary screening evaluations for regions exhibiting irregular terrain features where detailed site-specific surface (hourly) and upper atmospheric (twice daily as a minimum) meteorological data are not available. Additionally, worst case meteorological assumptions of 2.5 m/sec surface wind speed and a Pasquill-Gifford F stability (moderately stable) persisting for the entire 24-hr interval were utilized for all short-term screening analysis in this study, as further recommended by the EPA guidelines.

Geometric representations incorporated in the VALLEY complex terrain modeling analysis are presented in table 7-1. Terrain considerations are summarized in table 7-1 for the significant 22.5 degree cardinal compass wind directions and radial distances (in miles) from the point source model representation of the Creston Generating Station to the pertinent receptor locations near or within the Spokane Reservation. Receptor elevations and the base elevation of the station site are therefore included in table 4-1. Since the VALLEY program internally divides the radial distances from the site origin to the receptor locations into six equal radial segments, two separate radial intervals of 3.714 mi and 4.286 mi were also included in the modeling analysis, as shown in table 7-1. Figure 7-1 provides a visual perspective of the geometric parameters for the preliminary air quality screening analysis presented in table 7-1. Pertinent atmospheric emissions data and physical stack parameters were derived principally from the PSD application submitted to the EPA (Region X) by Washington Water Power Company (TWWPCo) for the Creston Generating Station (TERA, 1981 and 1982).

A number of candidate sources of low sulfur western coals are currently under consideration by TWWPCo for use at the CGS. For purposes of this analysis, five coals (A, B, C, D and E) can be considered representative of the range of fuels that could be used at CGS. The proximate and ultimate analysis and the ash mineral analysis for each coal are presented in table 7-2 and include the average value, as well as the range of values, for each constituent, based upon multiple samples.

The CGS stack emission rates for all four 570 Mwe units, operating simultaneously at the maximum guaranteed rating, are presented in table 7-3. The air emission rates shown in table 7-3 conservatively represent the maximum calculated values, assuming the particular coal yielding the highest value for a specific pollutant.

Similarly, the CGS physical stack parameters for each 570 Mwe unit are shown in table 7-4. It should be noted that the requirements of the recent EPA Good Engineering Practice (GEP) stack regulations were also factored into the air dispersion modeling analysis. The GEP stack height regulations (Federal Register, Vol. 47, No. 26, 8 February 1982 were invoked by the EPA under Section 123 of the Clean Air Act, which was added by the

Table 7-1 CRESTON GENERATING STATION -
GEOMETRIC PARAMETERS FOR VALLEY AIR QUALITY DISPERSION MODELING ANALYSIS
OF SPOKANE RESERVATION

CARDINAL COMPASS PLUME DIRECTION	RADIAL DISTANCE FROM PLANT SITE ORIGIN (MI)													
	3.71	4.29	7.43	8.57	11.14	12.86	14.86	17.143	18.57	21.42	22.29	25.71	26.00	30.00
N	2435	2435	2520	2540	2000	1800	2600	2230	3450	2350	3800	2370	4050	2300
NNE	2200	2455	2200	2500	2200	2650	4090	1350	2000[a]	2400[a]	2400[a]	3870[a]	2400	4050
NE	2400	2070	2200	2000	2200	2250	2640	2280	2650	1500[a]	2000[a]	4010[a]	3200[a]	3500[a]
ENE	2350	2350	2500	2420	1750	2380	2500	2560	1800	1720[a]	2100[a]	3415[a]	2500[a]	2350

Notes:

1. Receptor elevations in units of ft MSL; base elevation: 2370 ft MSL.
2. Receptor locations within the boundaries of the Spokane Reservation are designated by superscript "a".

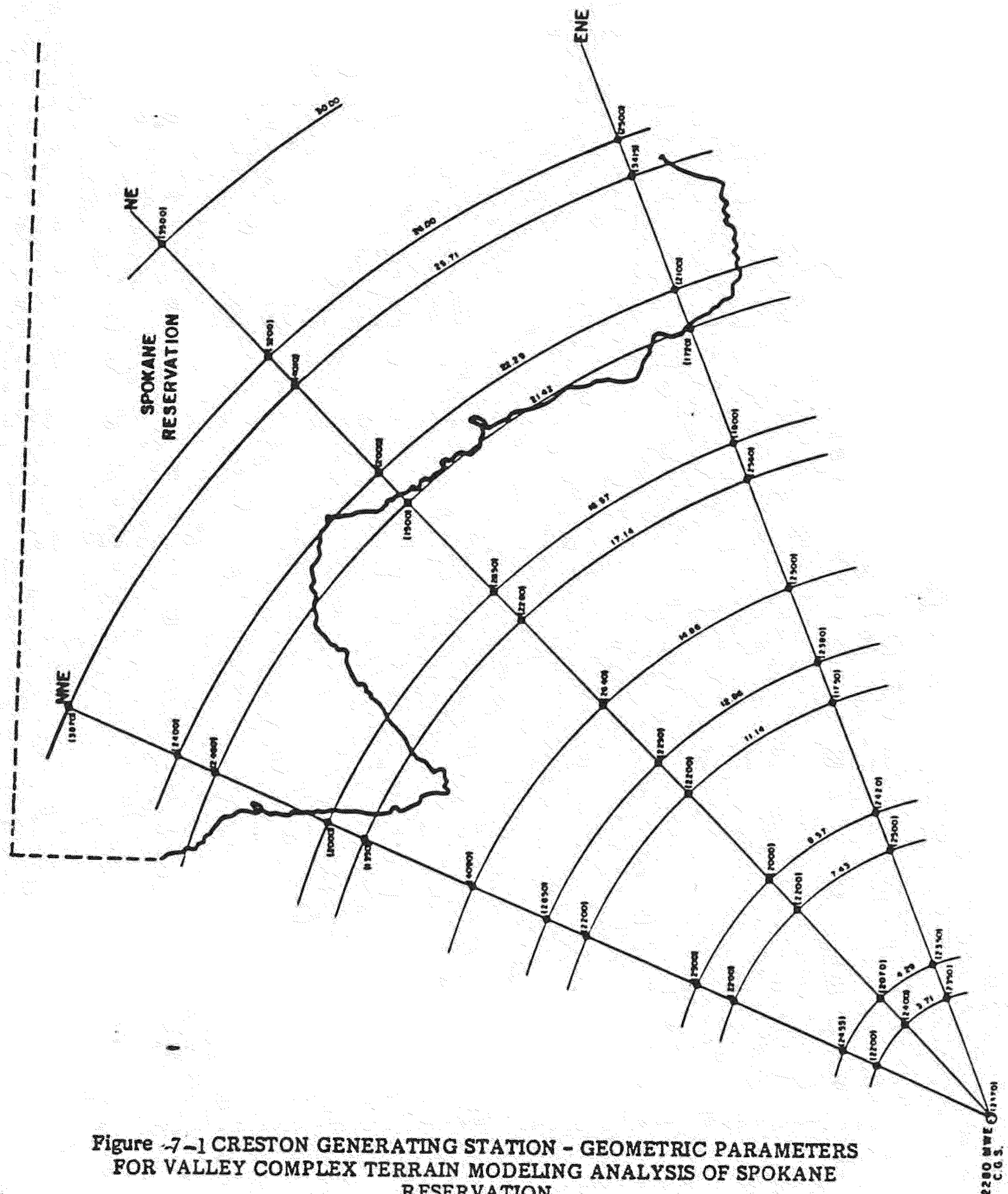


Figure 7-1 CRESTON GENERATING STATION - GEOMETRIC PARAMETERS FOR VALLEY COMPLEX TERRAIN MODELING ANALYSIS OF SPOKANE RESERVATION

Table 7-2 SUMMARY OF COAL AND ASH CHARACTERISTICS

Characteristic	Coal A Average	Coal A Range	Coal B Average	Coal B Range	Coal C Average	Coal C Range	Coal D Average	Coal D Range	Coal E Average	Coal E Range
Proximate Analysis (%) As Recived Basis										
Moisture	21.00	19.00-22.00	23.63	—	24.02	23.57-24.33	23.41	20.25-24.69	12.00	—
Volatile Matter	36.00	34.80-37.00	32.25	—	31.21	29.81-32.39	29.76	26.15-32.59	34.10	29.90-40.40
Fixed Carbon	37.90	37.62-40.24	38.50	—	40.30	40.25-40.36	36.56	34.29-39.20	45.20	34.60-52.70
Ash	6.00	4.15-6.91	5.62	—	4.47	3.68-5.68	10.27	8.65-11.73	8.80	7.60-33.60
Heating Value,BTU/lb	9500	9475-9908	9268	9056-9523	9200	9194-9711	8654	8501-9029	10661	10500-11100
Ultimate Analysis (%) As Received Basis										
Moisture	21.00	—	23.63	22.00-26.25	24.02	—	23.41	20.25-24.69	12.00	11.2-12.6
Carbon	55.14	52.76-57.16	53.80	51.93-55.20	54.44	53.26-55.69	50.65	49.18-52.94	61.18	59.1-63.1
Hydrogen	4.19	4.16-4.36	3.76	3.70-3.80	3.79	3.59-3.83	3.43	3.09-3.62	4.44	4.3-4.6
Nitrogen	1.04	1.00-1.19	0.95	0.90-1.00	0.89	0.83-0.95	0.74	0.49-1.16	1.54	1.3-1.8
Chlorine	0.02	0.02-0.03	0.01	0.00-0.02	0.01	0.00-0.02	0.01	0.00-0.02	0.00	0.00
Sulfur	0.40	0.30-1.00	0.46	0.32-0.55	0.50	0.40-0.50	0.73	0.60-0.89	0.73	0.6-1.2
Ash	6.00	4.15-6.91	5.62	3.00-8.00	4.47	3.68-5.68	10.27	8.[illegible]5-11.[illegible]3	8.[illegible]	6.[illegible]-11.[illegible]
Oxygen	14.12	12.19-14.32	11.77	10.50-12.40	11.88	11.2[illegible]-12.33	10.76	9.98-12.42	11.31	10.2-12.3
Ash Mineral Analysis Ignited Basis										
Silica, SiO	53.31	49.37-54.71	34.29	30.00-40.00	32.48	27.10-41.33	38.64	35.41-42.58	43.63	38.30-48.95
Alumina, Al_2O_3	10.45	8.14-13.63	18.91	11.00-20.00	17.13	16.34-18.58	18.27	16.68-21.27	24.96	22.42-27.50
Ferric Oxide, FE_2O_3	6.25	5.81-11.63	—	—	6.13	4.90-8.46	6.25	4.18-8.25	—	—
Titania, TiO_2	0.64	0.46-0.75	—	—	1.05	1.00-1.11	0.67	0.38-1.36	—	—
Phos. pentoxide, P_2O_5	0.40	0.06-0.67	—	—	0.92	0.49-1.06	0.41	0.18-1.70	—	—
Lime, CaO	12.19	8.36-15.52	—	—	15.12	11.65-17.28	14.80	12.64-16.82	—	—
Magnesia, MgO	5.18	3.16-6.03	—	—	4.26	2.75-5.11	2.82	1.21-4.43	—	—
Sodium Oxide, Na_2O	0.44	0.28-0.57	4.74	3.00-6.5	6.44	6.10-9.00	2.53	0.46-3.67	3.51	3.39-3.63
Potassium oxide, K_2O	0.59	0.39-0.69	—	—	0.74	0.45-0.[illegible]8	1.06	0.[illegible]7-1.46	—	—
Sulfur trioxide, SO_3	8.56	6.39-11.46	—	—	15.26	11.16-19.26	13.63	10.48-15.77	—	—
Undetermined	1.99	—	—	—	0.67	—	0.92	—	—	—

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Table 7-3 CGS STACK EMISSION RATES
FOUR 570 Mwe UNITS

Pollutant	Maximum CGS Emission Rate Four Units[a] (gm/sec)	Coal Yielding Maximum Emission Rate
<u>Pollutants Regulated Under Clean Air Act:</u>		
Carbon Monoxide	153.2	D
Nitrogen Oxides	1593.2	E
Sulfur Dioxide	574.5[b]	D
Particulate Matter	79.6	All
Ozone (Volatile Organic Compounds)	1.52	D
Lead	0.14	B
Asbestos	Negligible	All
Beryllium	0.009	B
Mercury	0.015	A,C
Vinyl Chloride	Negligible	All
Flourides	0.578	D
Sulfuric Acid Mist	40.78	D
Total Reduced Sulfur (incl. H_2S)	Negligible	All
Reduced Sulfur Compounds (incl. H_2S)	Negligible	All
Hydrogen Sulfide	Negligible	All
<u>Other Pollutants:</u>		
Antimony	0.0013	D
Arsenic	0.0065	D
Barium	12.915	B
Boron	0.813	B
Cadmium	0.0361	C
Cobalt	0.0263	B
Chromium	0.1363	B
Copper	0.1622	B
Manganese	0.5501	B
Nickel	0.0909	B
Selenium	0.0147	A
Vanadium	0.287	B
Zinc	0.4362	B

[a] Four units operating simultaneously at maximum guaranteed rating.
[b] After 86.5% SO_2 removal by flue gas desulfurization system.

1977 Clean Air Act Amendments. Section 123 prohibits stacks taller than Good Engineering Practice (GEP) height and other dispersion techniques from affecting the emission limitations required to meet the National Ambient Air Quality Standards (NAAQS) or PSD air quality increments. These regulations do not limit the physical stack height or any source. Instead, they set limits on the maximum stack height credit to be used in ambient air quality modeling for the purpose of setting an emission limitation and for calculating the air quality impact of a source. Sources are generally modeled at the physical stack height unless that height exceeds their GEP stack height. The regulations apply to all stacks constructed and all dispersion techniques implemented since 31 December 1970.

7.1.2 Air Quality Dispersion Modeling Results

Since the most stringent air quality regulations are currently the PSD incremental standards, the preliminary air dispersion modeling analysis is predicated upon compliance of the CGS with the annual and 24-hr PSD increments for $SO_2$and particulate emissions, as set forth in 40 CFR Part 52.21 and modified in Section 160-169 of the Clean Air Act Amendments of 1977, at selected receptor locations on the Spokane Reservation. The PSD air quality increments for SO_2 and particulate matter are again provided in table 7-5. Areas in the United States that presently have lower ambient air quality than that specified in the NAAQS are designated as nonattainment areas; the remainder of the United States is designated Class II.

Redesignation by the state of Class II areas to either Class I or Class III is possible.

Table 7-4 CGS STACK PARAMETERS

FOR EACH 570 Mwe UNIT

STACK PARAMETER [a]	ENGLISH UNITS	METRIC UNITS
Height	555 ft	169.2 m
Inside Diameter	22 ft	6.7 m
Exit Temperature	170 F	350 K
Exit Velocity	85.1 ft/sec	26.1 m/sec.

[a] All parameters based upon operation at maximum guaranteed rating, firing Coal D; one stack per 570 Mwe boiler unit.

[b] The stack height listed is the Good Engineering Practice (GEP) stack height; in accordance with EPA's proposed regulations (Federal Register, Vol. 47, No. 26 8 February 1982).

Additionally, the PSD allowable increments for SO_2 and particulate matter cannot exceed the allowable concentrations for those pollutants, as specified in the National Ambient Air Quality Standards (NAAQS), when combined with the respective measured ambient background concentrations of these species within the area of interest, i.e., the Spokane Reservation. Areas in the United

States that presently have lower ambient air quality that specified in the NAAQS, presented in table 7-6, are designated by EPA as nonattainment areas. Since the region encompassing the Spokane Reservation is currently an area of light to moderate industrial development activity, the less stringent NAAQS would probably not be exceeded at the present time for SO_2 or particulate matter. However, an on-reservation environmental air quality monitoring program would be needed and is recommended to adequately establish ambient background concentrations for the two aforementioned pollutants.

The results of the preliminary screening analysis for the Creston Generating Station (CGS) are summarized in table 7-7 for pertinent receptor locations within the boundaries of the Spokane Reservation. Predicted concentrations on both an annual and a 24-hr basis at specific on-reservation receptor locations for both SO_2 and particulate matter are presented in table 7-7. The pollutant values shown in table 7-7 are based upon a maximum CGS generating capacity of 2280 Mwe. Additionally, and SO_2 emission control efficiency of 86.5% is assumed in the analysis to reflect the minimum requirement for Class II air quality compliance, as set forth in the TWWPCo application for the CGS PDS permit (TERA, 1981-1982). The particulate matter emission rates are based upon limits of 0.03 lb particulate matter per million Btu plant energy equivalent, as prescribed by EPA's New Source Performance Standard (NSPS) for coal- fired electric power generating stations.

Table 7.5 PSD AIR QUALITY INCREMENTS

Pollutant	Averaging Time	Maximum Allowable Increase (ug/m^3) Class I[b]	Class II[c]	Class III[d]
Particulate	Annual	5	19	37
Matter	24-hr	10	37	75
SO_2	Annual	2	20	40
	24-hr	5	91	182
	3-hr[e]	25	512	700

a 40 CFR 52.21 and 42 USC 7401 Et seq. Section 163.

b Class I: Pristine areas, larger National Parks and Wilderness Areas, etc; subject to highest control.

c Class II: areas of moderate growth.

d Class III: areas of major industrialization.

The annual concentrations for particulate matter emanating from the 2280 Mwe CGS are shown in table 7-7 to vary from 0.1 to 0.7 ug/m^3 at pertinent receptor locations on the Spokane Reservation. Similarly, the 24-hr concentrations for particulate matter at the same receptor locations are shown to vary from 0.1 to 5.8 ug/m^3 . It may be concluded that particulate matter concentrations on the Spokane Reservation resulting from emissions from the 2280 Mwe CGS would be well within the allowable annual and 24-hr Class I and Class II PSD incremental standards for particulate matter, on the basis of the previously described, conservative VALLEY model screening analysis methodology employed in this analysis. Thus, the existing control technology, based upon NSPS requirements (0.03 lb particulate matter/ 10^6Btu), would also be sufficient to satisfy the requirements for compliance with the very stringent Class I PSD increment for particulate matter concentrations at receptor locations on the Spokane Reservation.

The preliminary screening analysis results for SO_2 concentrations on the Spokane Reservation due to operation of the 2280 Mwe CGS, employing flue gas desulfurization (FGD) with a design capability for an emission control efficiency of 86.5%, are also presented in table 6-7 on both a 24-hr and an annual basis. Annual SO_2concentrations at pertinent receptor locations on the Spokane Reservation are shown in table 7-7 to vary from 0.4 to 5 ug/m^3. The maximum annual SO_2concentration of 5.0 ug/m^3 is in compliance with the standard for the annual Class II PSD increment of 20 ug/m^3, but exceeds the more stringent allowable annual Class I PSD increment of 2 u/m^3 . Similarly, the range of predicted values for 24-hr SO_2concentrations on the reservation is shown to vary from 0.1 to 53.9 ug/m^3. Thus, the peak 24-hr SO_2concentration of 53.9 ug/m^{3}at on-reservation receptor locations is in compliance with the allowable 24-hr Class II PSD increment of 91 ug/m^3 , but exceeds the allowable 24-hr Class I PSD increment of 5 ug/m^3.

Table 7-6 NATIONAL AMBIENT AIR QUALITY STANDARDS

	AVERAGING TIME	PRIMARY STANDARD (ug/m^3)	SECONDARY STANDARD (ug/m^3)
SO_2	Annual	80	-
	24-hr.	365	-
	3 hr.	-	1,300
Particulate matter	Annual	75	60
	24-hr.	260	150
NO_x (as NO_2)	Annual	100	100
Ozone	1 hr.	240	240
Carbon monoxide	8 hr.	10,000	10,000
	1 hr.	40,000	40,000
Lead	Quarterly	1.5	1.5
Hydrocarbons (non-CH_4)	3 hr.	160[b]	160[b]

[a] 40 CFR Part 50. Reference conditions = 760 mm Hg and 25°C.

[b] Not a standard; a guide to show achievement of the ozone standard.

It may be concluded that the CGS at a maximum generating capacity of 2280 Mwe with an FGD system capable of 86.5% SO_2 emission control efficiency, as specified in the TWWPCo application for the PSD permit for the CGS, will meet both the allowable annual and 24-hr Class II SO_2PSD increments at pertinent receptor locations on the Spokane Reservation (TERA, 1982). However, a higher

Table 7-7 PRELIMINARY SCREENING ANALYSIS - 2280 Mwe CGS ANNUAL AND 24-HR SO_2 AND PARTICULATE MATTER CONCENTRATIONS (ug/m^3) AT RECEPTOR LOCATIONS ON THE SPOKANE RESERVATION.

PLUME DIRECTION	POLLUTANT	SAMPLING TIME INTERVAL	RADIAL DISTANCE FROM CGS SITE ORIGIN (MI)					
			18.57	21.42	22.29	25.71	26.00	30.00
NNE	SO_2	24-hr	0.1	0.1	0.1	34.6	-	-
		Annual	0.5	0.6	0.6	3.3	-	-
	PM	24-hr	<0.01	<0.1	<0.1	4.8	-	-
		Annual	0.1	0.1	0.1	0.5	-	-
NE	SO_2	24-hr	-	0.2	0.2	28.8	35.0	41.8
		Annual	-	0.7	0.7	4.3	3.3	5.0
	PM	24-hr	-	<0.1	<0.1	5.0	-	5.8
		Annual	-	0.1	0.1	0.6	0.5	0.7
ENE	SO_2	24-hr	-	0.1	0.1	53.9	0.1	-
		Annual	-	0.4	0.4	4.6	0.4	-
	PM	24-hr	-	<0.1	<0.1	5.5	0.1	-
		Annual		0.1	0.1	0.6	0.1	-

Notes:
1. SO_2 emission rate is based upon 86.5% emission control efficiency to satisfy NSPS and Class II PSD increment.
2. Particulate matter (PM) emission rate is based upon NSPS allowable requirement of 0.03 lb of particulates per million Btu energy released.

emission control efficiency for CGS So_2 atmospheric emissions would have to be effected in order to comply with the more stringent Class I PSD incremental standard, based upon the modeling techniques employed for this analysis.

The predictive results presented in table 7-7 may be considered reasonable in terms of emission control requirements, since it must be emphasized that the CGS emission control systems were designed for compliance with the existing NAAQS and Class II PSD incremental standards for the general region surrounding the CGS facility, which includes both the Colville and Spokane reservations, as shown in map 1.

An additional comparison of predictive results utilizing the VALLEY air dispersion model, the EPA COMPLEX I model and the EPA CRSTER model is presented in table 7-8 for both annual and 24-hr SO_2 concentrations at the Johnny St. George Mountain receptor location on the Colville Reservation (see map 1).

EPA considers CRSTER to be a "refined" dispersion modeling technique. The CRSTER model is a steady-state Gausian plume dispersion model designed by EPA for evaluation of point source impacts (EPA, 1977). The model has been used primarily in simulating the behavior of stack effluents from combustion sources. Each model "run" of CRSTER calculates pollutant concentrations for each hour of a calendar year at up to 180 receptor locations located on a radial grid. Thus, the CRSTER model affects more sophistication than the VALLEY model in terms of simulation of both surface and upper atmospheric meteorological data (not available to CERT for this analysis), as well as more geometric flexibility in terms of establishing a more detailed receptor grid. The model also has the ability to account for uneven terrain of land forms below the elevation of the stack, which in the case of this CGS scenario includes any elevation below 2925 ft MSL.

The EPA COMPLEX I is a multiple point source code with terrain adjustment. It uses the same basic dispersion algorithm as the VALLEY program, including consideration of buoyancy-induced dispersion, and modifies the algorithm to incorporate a half-height correction for unstable plumes and actual hourly surface wind data as input. Thus, COMPLEX I is considered to be a somewhat more refined screening technique that the 24-hr short-term version of the VALLEY MODEL, IN THAT COMPLEX I used actual hour-by-hour surface meteorological data and twice daily upper atmosphere mixing height data as input, rather than the conservative, hypothetical, short-term meteorological conditions assumed by VALLEY.

The predicted 24-hr SO_2 concentrations obtained utilizing the CERT VALLEY modeling methodology are shown in table 4-8 to be comparable to the COMPLEX I analysis performed by TERA for TWWPCo utilizing 1977 Spokane NWS hourly surface meteorological data; comparable annual SO_2 concentrations are shown for COMPLEX I utilizing site-specific TWWPCo hourly surface meteorological data compiled in 1980. The considerably lower predicted values for both maximum annual SO_2 concentrations (2.5 ug/m^3 vs. 6.3 ug/m^3) and 24-hr maximum SO_2 concentrations (34.5 ug/m^3 vs 49.7 ug/m^3) obtained by utilization of the CRSTER model, as compared with the CERT VALLEY modeling methodology, may be explained at least in part by the fact that the receptor elevation of 4,090 ft MSL at Johnny St. George Mountain exceeds the upper limit of the CGS stack elevation (2,925 Ft MSL) by about 1,165 ft. Therefore, in accordance with EPA guidelines, those areas, including the on-reservation reception locations exhibiting the maximum SO concentrations, that are greater than 3,000 ft MSL elevation cannot be properly simulated with the CRSTER model for purposes of assessing compliance with NAAQS and PSD increments.

The foregoing comparison of air dispersion modeling techniques justifies the use of CERT's VALLEY modeling methodology to conduct the subsequent sensitivity analysis to evaluate additional requirements for the CGS So_2 emission control system to comply with allowable 24-hr and annual SO_2 Class I PSD increments for receptor locations on the Spokane Reservation. The results of the sensitivity analysis are summarized in table 7-9 and figure 6-2. As anticipated, with utilization of the VALLEY model the maximum 24-hr SO_2 predicted concentrations set the upper limit on emission control requirements for Class I PSD compliance, as illustrated in table 7-9 and figure 7-2, since the CGS is unable to comply with the 24-hr Class I PSD increment with an SO_2 emission control efficiency of 95%. Conversely, a 94.5% SO_2 emission control efficiency would effect Class I PSD compliance for SO_2 concentrations on an annual basis for the maximum on-reservation receptor. Similarly, with three CGS units operating at a maximum total CGS electrical generating capacity of 1510 Mwe, annual SO_2 Class I PSD compliance would be achieved on the Spokane Reservation with an emission control efficiency of approximately 93%, while 24-hr SO_2 Class I PSD compliance would require an emission control system greater than 95%, as shown in table 4-9 and figure 7-2. Two 570 Mwe CGS units representing 1140 Mwe, or 50% of the maximum generating capacity for the facility, would require about 89% emission control efficiency for Class I SO_2 PSD compliance on an annual basis, with a greater than 95 % emission control system being required for 24-hr SO_2 Class I PSD compliance.

Summarily, the predicted maximum 24-hr SO_2 concentrations are are in table 7-9 and figure 4-2 to be in compliance with the allowable Class I PSD increment with one 570 Mwe CGS unit operating with and SO_2 emission control efficiency of 95%. On an annual basis, however, the lower bound of values assumed for SO_2 emission control efficiency, 86.5%, would satisfy Class I PSD increment requirements for one 570 Mwe CGS unit operating at maximum generating capacity. It may be concluded, on the basis of this preliminary screening analysis, that the CGS would be unable to comply with Class I PSD limits for maximum SO_2 Concentrations within the boundaries of the Spokane Reservation, since vendor or

Table 7-8 SUMMARY OF COMPARATIVE VALLEY, COMPLEX I AND CRSTER SO_2 MODELING RESULTS FOR 2280 CGS STACK EMISSIONS - JOHNNY ST. GEORGE MOUNTAIN RECEPTOR LOCATION

DISTANCE FROM CGS STACKS (MI)	SO_2 CONCENTRATIONS, ugm^3							
	TERA/TWWPCo[a,b,c] COMPLEX I MODEL		CERT VALLEY MODEL		TERA/TWWPCo[a] VALLEY MODEL		TERA/TWWPCo[a] CRSTER MODEL	
	ANNUAL MAXIMUM	24-HR MAXIMUM	ANNUAL MAXIMUM	24-HR MAXIMUM	ANNUAL MAXIMUM	24-HR MAXIMUM	ANNUAL MAXIMUM	24-HR MAXIMUM
13.69 (Johnny St. George Mountain)	**2.9** (4.8)	**53** (80)	6.3	49.7	9.3	90.9	2.5	34.5

a. Predictive results taken from PSD application submitted by TERA for TWWPCo for CGS (1981 and 1982).

b. 1977 Spokane, Washington NWS meteorological data used to obtain predicted values in bold type.

c. 1980 site specific TWWPCo meteorological data used to obtain predicted values in parenthesis.

Table 7-9 PRELIMINARY SCREENING ANALYSIS
CGS MAXIMUM ANNUAL AND 24-HR SO_2 CONCENTRATIONS ON THE SPOKANE RESERVATION AS A FUNCTION OF ELECTRICAL GENERATING CAPACITY AND EMISSION CONTROL EFFICIENCY REQUIREMENTS FOR CLASS I AND CLASS II PSD COMPLIANCE

CGS GENERATING CAPACITY, Mwe	MEASURED INTERVAL	MAXIMUM ALLOWABLE PSD INCREMENT (ug/m^3) CLASS I	CLASS II	SO_2 EMISSION CONTROL EFFICIENCY 86.5%	90%	92%	95%
2280	24-hr	5	91	53.9	39.9	31.9	20.0
	Annual	2	20	5.0	3.7	2.9	1.8 (94.5%)
1510	24-hr	5	91	40.4	29.9	23.9	15.0
	Annual	2	20	3.8	2.8	2.2	1.4 (92.8%)
1140	24-hr	5	91	27.0	20.0	16.0	10.0
	Annual	2	20	2.5	1.8 (89.1%)	1.5	0.9
570	24-hr	5	91	13.5	10.0	8.0	5.0
	Annual	2	20	1.2	0.9	0.7	0.4

Notes: 1. Values in parenthesis indicate $S0_2$ percentage emission control efficiency required to achieve PSD compliance.

2. All concentrations are given in units of micrograms per cubic meter.

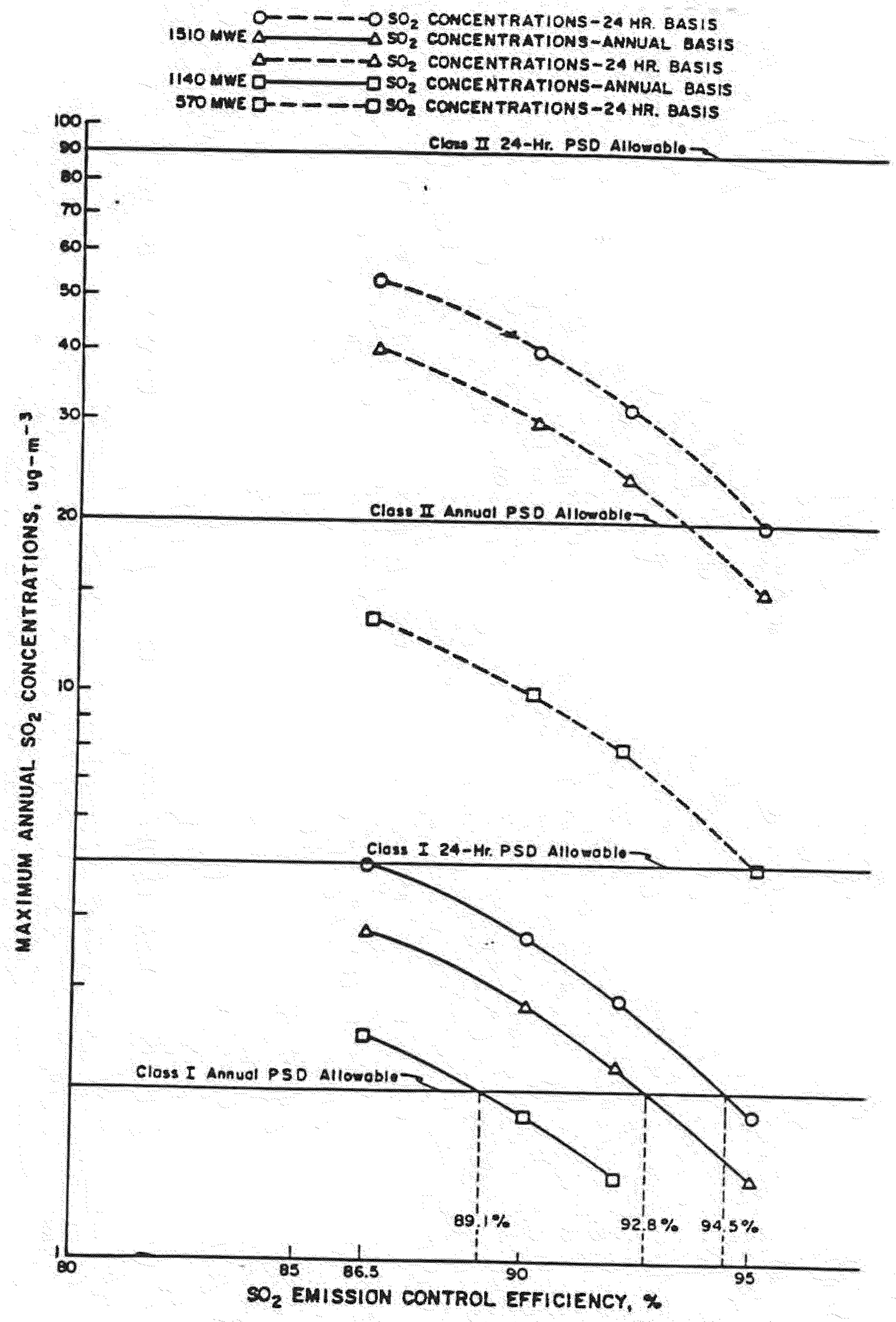

Figure 7-2 PRELIMINARY CGS MAXIMUM ANNUAL AND 24-HR SO_2 CONCENTRATIONS ON THE SPOKANE RESERVATION AS A FUNCTION OF ELECTRICAL GENERATING CAPACITY AND EMISSION CONTROL EFFICIENCY REQUIREMENTS FOR CLASS I AND CLASS II PSD COMPLIANCE

manufacturer's guarantees for installed FGD systems for large coal-fired electrical power generating stations do not exceed a long-term SO_2 emission control efficiency of 90-92% at the present time.

However, as shown in figure 7-3, and Class II allowable PSD increments for SO_2 and particulate emissions from the CGS at maximum rated capacity of 2280 Mwe could be satisfied to a radial distance of about 25 miles from the CGS site. Hence, the cross-hatched portion of the reservation shown in figure 7-3 would comply with the Class II PSD increment, on the basis of this preliminary assessment.

7.2 PRELIMINARY LEVEL-VISIBILITY MODELING ANALYSIS

Section 169A of the Clean Air Act (40 CFR Part 51) requires the EPA to promulgate regulations to assure reasonable progress toward the congressionally declared goal of "the prevention of any future and the remedying of any existing impairment of visibility in mandatory Class I federal areas which impairment results from man-made air pollution." Since the Spokane Reservation is currently designated as a Class II Air Quality area, the foregoing visibility regulations do not require compliance. In fact, should the tribe redesignate the reservation to a Class I air quality status, there would not presently be a requirement for a visibility analysis, since the reservation would not be a mandatory Class I area. Nevertheless, at the request of the Spokane Tribe, a preliminary Level-1 visibility modeling analysis was performed to assess the potential for visibility impairment within the boundaries of the reservation as a result of CGS operation.

7.2.1 Brief Synopsis of Visibility Impairment

Although Congressional guidance on the definition of visibility impairment is significant, a number of important areas are left open for additional specification, interpretation and judgment. Section 169A of the Clean Air Act indicates that visibility impairment includes reduction in visual range and atmospheric discoloration. Visual range, long used as an index of visibility in airport observations, generally is defined as the farthest distance from which one can see a large black object against the horizon sky. Atmospheric discoloration can qualitatively be defined as a pollution-caused change in the color of the sky, distant mountains, clouds or other objects.

Conceptually, virtually any type of visibility impairment could ultimately be expressed as a reduction of visual range or as atmospheric discoloration. Because these effects are often the results of the same pollution impact, it is useful to categorize anthropogenic (man's impact on nature) visibility impairment into three general types: (1) widespread regionally homogeneous haze that reduces visibility in every direction from an observer, (2) smoke, dust or colored gas plumes that obscure the sky or horizon relatively near to sources (this class is also termed "plume blight") and (3) bands or layers of discoloration or veiled haze

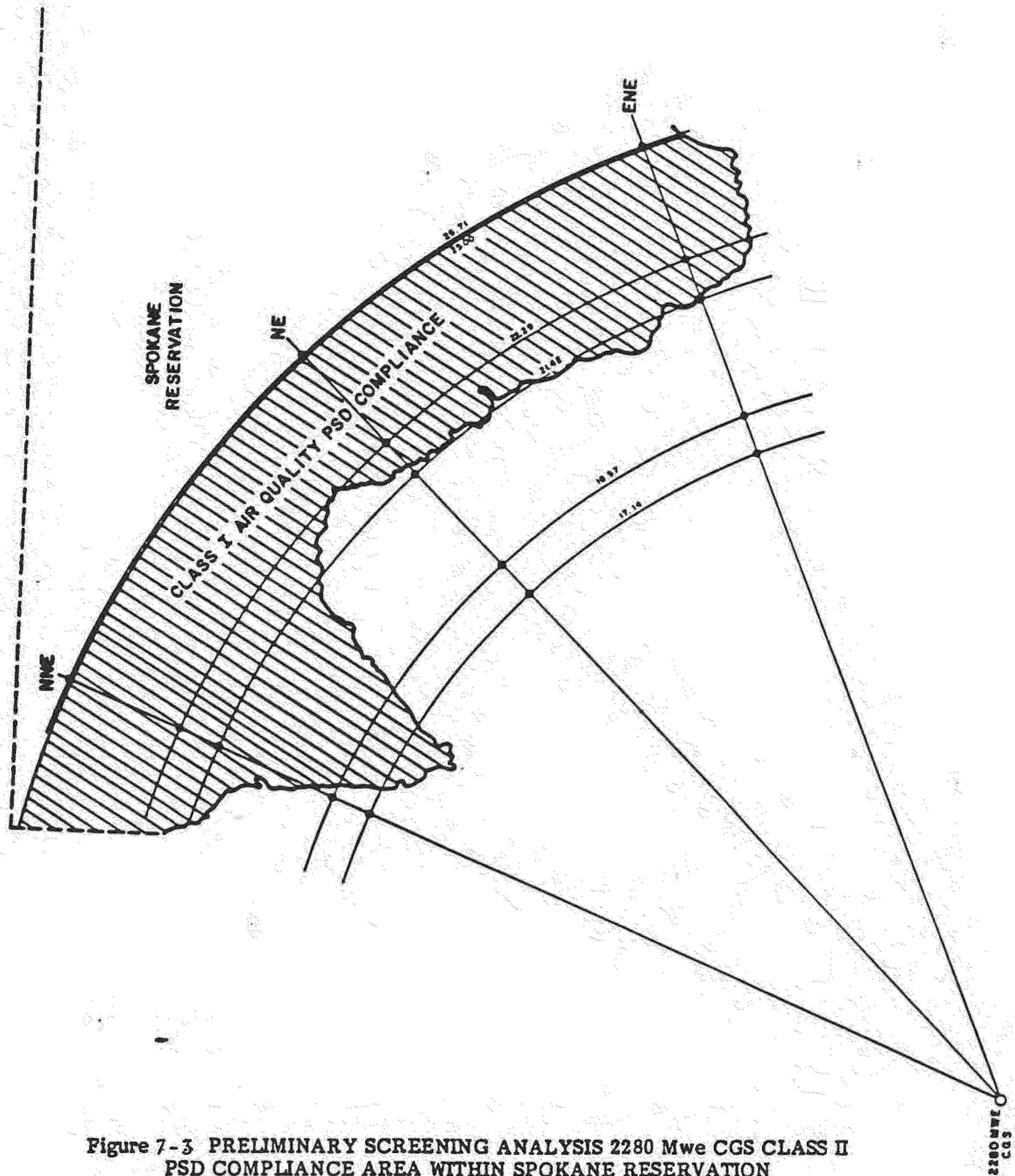

Figure 7-3 PRELIMINARY SCREENING ANALYSIS 2280 Mwe CGS CLASS II PSD COMPLIANCE AREA WITHIN SPOKANE RESERVATION

appearing above the surrounding terrain.

The location, the degree and the spatial and temporal extent of visibility impairment must be addressed in visibility protection programs. In areas such as the southwest, anthropogenic air pollution occurring outside Class I area boundaries can obscure long-distance vistas normally visible from within the Class I area. Anthropogenic impairment may be frequent, last for long time periods, and be readily apparent to all observers. Conversely, anthropogenic visibility impacts may be so infrequent, short in duration, or small in degree that it is difficult for the unaided observer to distinguish them from existing impairment caused by natural sources.

Some insight into general visibility conditions can be obtained by examining the regional airport visibility (visual range) data depicted in figure 7-4. Although some limitations in airport observations exist, the information is indicative of regional trends. The best visibility occurs in the mountainous southwest, where annual median visibility exceeds 70 mi (110 km). East of the Mississippi and south of the Great Lakes, annual median visibilities are less than 15 mi (24 km) and significantly lower in the summertime. Figure 7-4 does not address plume blight or discoloration. Ironically, these latter problems can be more severe in "clean" regions. For example, in the southwest, the region of highest visual range, visible plumes can be seen from great distances.

The ability to define, monitor, model and control anthropogenic visibility impairment is dependent on available scientific and technical understanding of the factors that affect atmospheric visibility. Because visibility involves the human perception of the physical environment, evaluation of the effects of air pollution on visibility must include:

* specification of the process of human visual perception, and
* Quantification of the impacts of air pollution on the optical characteristics of the atmosphere.

From a scientific/technical point of view, deterioration of visual air quality is probably the best understood and most easily measured effect of air pollution. However, many important uncertainties and limitations exist in available knowledge. Significant implications of current understanding of visibility in the atmosphere may be summarized as follows.

* Visibility impairment is caused by the scattering and obsorption of light by suspended particles and gases. Fine solid or liquid particles (atmospheric aerosols) and, to a lesser extent, nitrogen dioxide are generally the most important anthropogenic causes of degraded visual air quality. Air molecules, weather variables and natural emissions also affect visibility.
* Light scattering and light absorbing pollutants reduce the amount of light received from viewed objects and scatter

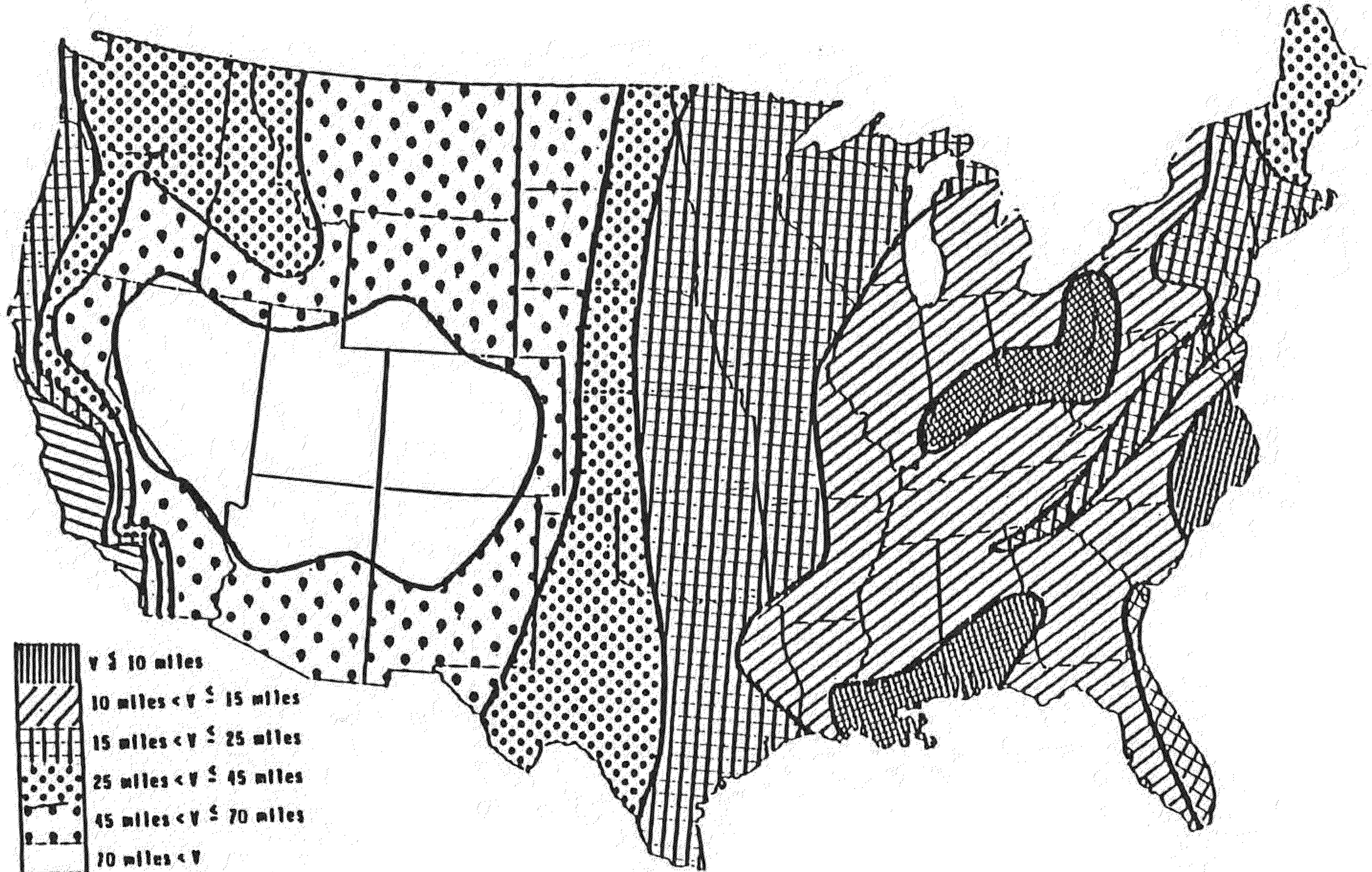

Figure 7-4 VISUAL RANGE ISOPLETHS (MI) FOR SUBURBAN/NONURBAN AREAS, 1974-76.

ambient (or "air") light into the line of sight. This scattered air light is perceived as haze. Because these effects vary with the wavelength of light, discoloration can result.

* These effects can be quantified or approximated through use of theoretical mathematical treatments and experimentally derived pollutant/optics relationships.
* The perceptibility of pollution effects on light depends on human eye-brain response. Studies of the eye-brain response to visual contrast indicate that typical observers can detect a 0.02 (2%) or greater contrast between large dark objects and the horizon sky. Preliminary studies suggest that observers may be able to detect a 0.02 to 0.05 change in apparent contrast caused by incremental pollution. Additional work is needed on human perception of pollution increments.
* The perception of color in the atmosphere is less understood than contrast. For this reason, theoretical calculations of atmospheric discoloration are useful only as crude indices and guides for experimental measurements. Studies of atmospheric color perception conducted over the next few years should provide an adequate means of predicting atmospheric discoloration, even if a comprehensive theoretical treatment remains unavailable.
* Atmospheric discoloration are useful only as crude indices and guides for experimental measurements. Studies of

atmospheric color perception conducted over the next few years should provide an adequate means of predicting atmospheric discoloration, even if a comprehensive theoretical treatment remains unavailable.

* In many southwestern Class I areas, visibility on some days can approach the theoretical limit imposed by air molecules (blue sky) scattering (200-mi visual range). Visibility in such areas is extremely sensitive to increased emissions. The addition of 1 ug/m^3 of fine particles, spread throughout the viewing path, to such a clean atmosphere could reduce visual range by about 30%. Addition of the same amount to a dirtier background (20-mi visual range) would produce only a 3% reduction in visual range.

* Since viewing distances in most Class I areas do not exceed 50-100 km (30 to 60 mi), a reduction in calculated visual range from 200 km (120 mi) to 150 km (90 mi) would be noticed principally because of the reduction in contrast and discoloration of nearby objects and sky (haze). Increased haze causes objects to appear "flattened," the horizon sky is whitened, and the aesthetic value of the vista can be degraded, even though the viewing distances are small relative to the visual range.

* When particles and light-absorbing gases are confined to an elevated haze layer or a coherent plume, the main visual impact will be a discoloration of the sky or a white, gray or

brown plume. The perceived impact depends on a number of factors, such as sun angle and condition of background sky. Contrast and brightness effects of elevated haze and plumes con be approximated by available techniques. Additional work is needed to predict perceived color impacts.

7.2.2 PREVIS Visibility Model (Level-1 Visibility Screening Analysis)

The tentative visibility screening analysis procedure, as currently recommended by EPA guidelines, is presented in Figure 6-5. Potentially, one could analyze a given source at any one of three basic levels of detail. A Level-1 analysis involves a series of quite conservative screening tests that permit the analyst to eliminate sources with little potential for adverse or significant visibility impairment. If the Level-1 analysis, based upon hypothetical, worst-case meteorological conditions, indicates that visibility impairment is highly unlikely, further analysis is unnecessary.

If impairment is indicated by the Level-1 screening procedure as being possible, a Level-2 screening analysis is performed. It is similar to the Level-1 analysis in that its purpose is to estimate impacts during worst-case meteorological conditions; however, more specific information regarding the source, topography, regional visual range and meteorological conditions is assumed to be available. A frequency-of-occurrence analysis is performed to determine conditions representative of the worst day in a year, if possible.

If both the Level-1 and Level-2 analysis indicate the possibility of significant or adverse visibility impairment, a more detailed Level-3 analysis is recommended. The purpose of a Level-3 analysis is to provide an accurate description of the magnitude and frequency of occurrence of impact. For this level of analysis, the number of days per year and per season in which a given magnitude of impact occurs are calculated from joint frequency tables of wind speed, wind direction, stability, mixing depth, ozone concentration and visual range in the area.

Due to lack of definitive meteorological data and regulatory compliance requirements for the Spokane Reservation and the immediate surrounding area, as well as the time and monetary constraints for this assessment, only a Level-1 screening analysis was deemed practicable. The very conservative Level-1 screening analysis is designed to evaluate two potential types of visibility impairment caused by nitrogen oxide, particulate matter (less than 2 um diameter) and sulfur dioxide emissions. One type of visibility impairment is a discolored, dark plume observed against a bright horizon sky and is caused principally by No_2 gas formed from No_x emissions, although particulates can contribute in some cases. the other type of visibility impairment is caused by a bright plume observed against a dark terrain background.

The PREVIS visibility model developed by CERT is a computer-based, Level-1 visibility screening analysis technique to assess potential visibility degradation or impairment from NO_x (as No_2), particulate matter and SO_2 plume emissions. PREVIS entails the calculation of three contrast parameters as follows:

- o the plume contrast against the sky (C_1);
- o the plume contrast against terrain (C_2); and
- o changes in sky/terrain contrast caused by primary and secondary aerosols (C_3).

As currently envisioned by the U.S. Environmental Protection Agency, if the absolute value of C_1, C_2 or C_3 is greater than 0.10, the emission source fails the Level-1 visibility screening test, and further, more-detailed screening analysis is recommended to assess potential visibility impairment. If the absolute values of C_1, C_2, and C_3 are all less than 0.1, it is highly unlikely that the emission source would cause adverse visibility impairment in Class I designated area; therefore, further analysis of potential visibility impacts would be unnecessary.

If the emission source fails the emission tests for the three plume contrast criteria (i.e., C_1, C_2, or C_3 greater than 0.1), the PREVIS model performs an additional preliminary (or, first-order) sensitivity evaluation to determine the maximum emission levels or conversely, the degree of control required for NO_x, particulate matter and SO_2 plant plume emissions to meet the Level-1 visibility plume contrast criteria of C_1, C_2, and C_3 less than an absolute value of 0.1.

A more complete derivation and discussion of the Level-1 analysis procedure utilized by the PREVIS model is included in

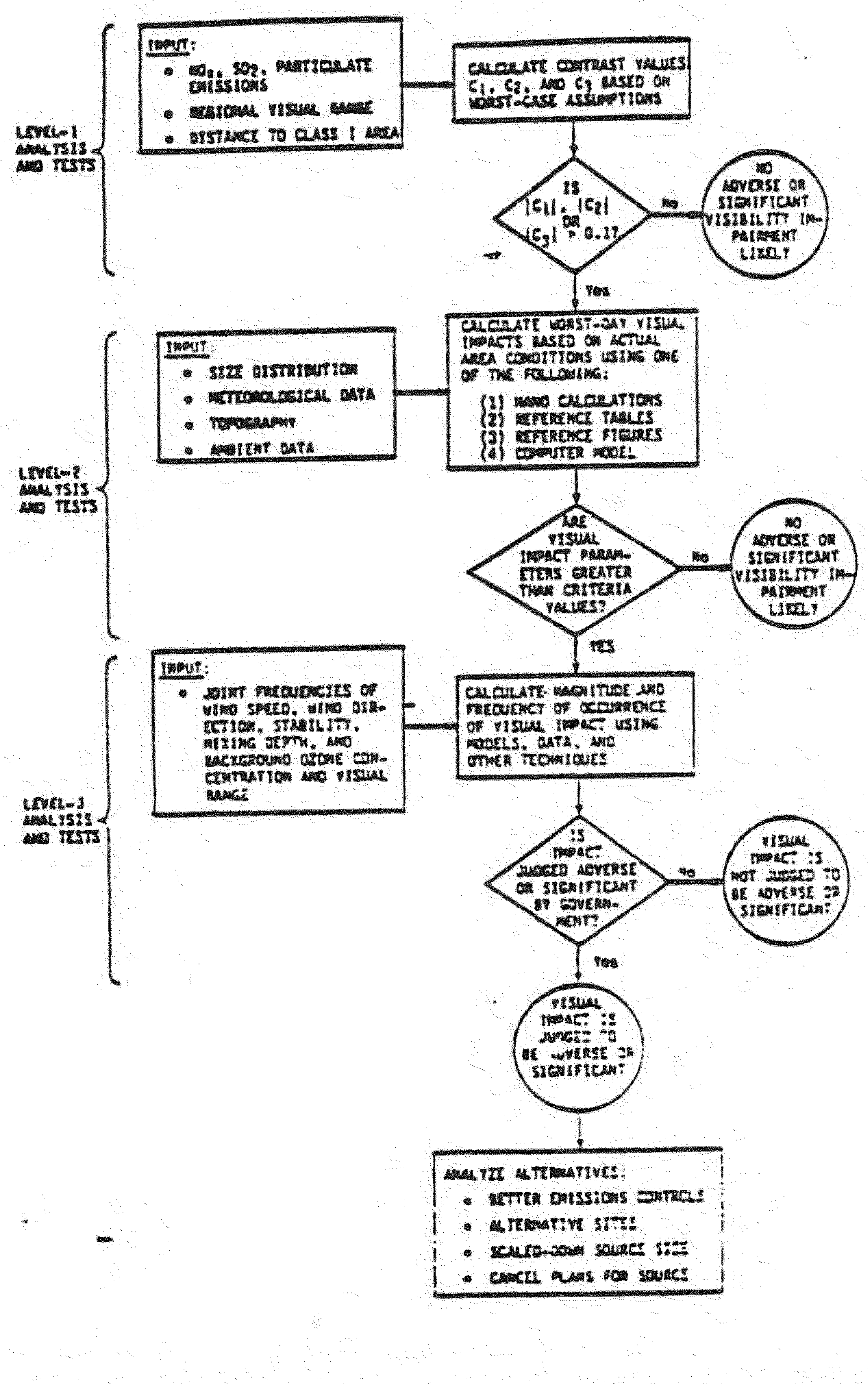

Figure 7-5 SCHEMATIC OF VISIBILITY SCREENING ANALYSIS PROCEDURE

the Fort Peck Air Quality and Visibility Analysis performed by CERT for the Fort Peck Assiniboine and Sioux Tribes (CERT, 1981).

7.2.3 Level-1 Visibility Modeling Analysis Results

The pertinent input data for the PREVIS Level-| visibility modeling analysis presented in table 7-10 was derived principally from the CGS operating parameters and pollutant atmospheric emission rates, as presented in tables 7-2, 7-3, and 7-4. Design estimates for emission rates, of SO_2, NO_x and particulate matter are identical to those values presented in table 4-3 for the preliminary air quality screening analysis. They represent SO_2 emission rates for an assumed emission control efficiency of 86.5% and NSPS allowable emission rates for NO_x and particulate matter of 0.7 lb NO_x /10^6 Btu and 0.03 lb particulate matter/10^6 Btu, respectively.

The assumptions for background visual range are based upon a range of values of 25 to 45 mi (40.23-72.42 km) and were derived directly from figure 7-4. The initial PREVIS Level-1 visibility analysis results shown in table 7-10 demonstrate that the CGS, as designed, fails the visibility tests for two of the three plume contrast parameters (C_1 and C_2) over the entire range of CGS electrical generating capacity, 570 Mwe (1 unit) to 2280 Mwe (4 units). Level-1 test failure is due to the close proximity of the CGS facility to the reservation boundary (approximately 16 mi), irrespective of the relatively low value (compared to the southwestern U.S.) for background visual range (25 mi) for this region of Washington. In general, major emission sources require separation distances from the source to the Nearest affected area boundary of 80 to 100 km to satisfy the requirements of the Level-1 screening analysis.

Hence, under the EPA visibility screening analysis procedural format outlined in Figure 7-5, a more detailed Level-2 and, possibly, a Level-3 visibility modeling analysis would be required if the Spokane Reservation were classified as a mandatory Class I air quality designated area.

However, a first-order or preliminary sensitivity analysis was performed utilizing the PREVIS computer program to establish the possible emission control requirements for the three primary pollutants affecting visibility impairment (SO_2 , and NO_x and particulate matter), and, concomitantly, to reduce contrast parameters C_1 and C_2 such that all three contrast parameters are numerically less than 0.1.

Table 7-10. PRIMARY INPUT PARAMETERS AND INITIAL RESULTS-PREVIS LEVEL-1 VISIBILITY SCREENING ANALYSIS OF THE SPOKANE RESERVATION FOR POTENTIAL VISIBILITY IMPAIRMENT FROM 2280 Mwe CGS OPERATION

STATION RATING, Mwe	2280	1710 (3 units)	1140 (2 units)	570 (1 unit)

Air Emissions, MT/Day:				
Particulate Matter	7.46	5.60	3.73	1.87
NO_x	137.76	103.32	68.88	34.44
SO_2	49.76	37.32	24.88	12.44
Distance to Reservation Boundary, miles	16	16	16	16
Background visual Range, mi	45	45	45	45
Contrast Parameters				
C_1	.438	.414	.361	.246
C_2	.356	.342	.309	.231
C_3	.009	.007	.004	.002

a. Particulate matter emission rates are based upon NSPS allowable requirement of 0.03 lb/10^6 Btu.

b. No_x emission rates are based upon NSPS allowable of 0.7lb/10^6 But.

c. SO_2 emission rates are based upon an emission control efficiency of 86.5%.

Since two of the three primary pollutants, i.e., SO_2 and particulate matter, have already been subjected to relatively high levels of emission control in order to achieve compliance with the existing Class II PSD increment and NSPS (as discussed previously in the air quality dispersion modeling analysis), additional No_x emission control affords a possible alternative for reduction of potential visibility impact from CGS operation.

Additional perusal of the initial calculated values for the Level-1 contrast parameters presented in table 7-10 reveals two salient factors that structure the subsequent PREVIS sensitivity analysis. Since only sulfur-containing atmospheric pollutants affect the C_3 contrast parameter in the analysis, and it is never exceeded (as shown in table 7-10), it may be concluded that SO_2) is not a significant pollutant for further consideration in the preliminary Level-1 screening procedure. Secondly, operation of no more than one CGS unit, with a maximum electrical generating capacity of 570 Mwe and with additional control of NO_x and /or particulate matter, can possibly satisfy the Level-1 contrast parameter test criteria.

Therefore, the final results of the preliminary PREVIS sensitivity analysis presented in table 6-11 establish possible additional NO_x and particulate matter emission control alternatives for a 570 Mwe (1 unit only) CGS facility.

Table 7-11. PREVIS PRELIMINARY VISIBILITY SENSITIVITY ANALYSIS-570 Mwe CGS-SPOKANE RESERVATION

	ALTERNATIVE 1	ALTERNATIVE 2

Air Emission, MT/Day:		
Particulate Matter	1.87	1.87
NO_x	34.44	34.44
SO_2	12.44	12.44
Distance to Reservation Boundary, miles	16	16
Background Visual Range, miles	45	45
Additional Particulate Matter Control, %	0	41.2
Additional NO_x Control, %	85.5	76.8
Additional SO_2 Control, %	0	0

The aforementioned results indicate that an 85.5% No_x emission control requirement would be necessary if no additional emission control of particulate matter was invoked on the single 570 Mwe unit of the CGS. Alternatively, the additional NO_x emission control requirement could be decreased to about 77% if a 41% control of particulate matter emissions were included in the CGS facility.

8.0 REGIONAL IMPACTS

8.1 Introduction

Throughout this section the Spokane Tribe will attempt to assess the impact of redesignation on those communities adjacent to the Spokane Reservation. This assessment should not be considered an exhaustive study of the potential impacts of redesignation but instead should be viewed as a general discussion of impacts as perceived by the Spokane Tribe. As the Tribe proceeds with its request for redesignation they will continue to define important issues through the public hearing process. The Spokane Tribe has requested technical assistance from EPA to refine the following assessment and considers it imperative that all concerned individuals and groups participate within the comment process.

It is the Tribes contention redesignation will enhance and maintain a way of life so important to tribal members and our neighbors. Class I Air is essential to preserving this regions economy based on agriculture, timber and tourism.

Class I redesignation is consistent with international, national and regional environmental goals. Recently the Reagan Administration and Canadian government endorsed a mutual agreement to take what ever steps necessary to eliminate the pernicious affects of acid rain caused by increased levels of sulphur dioxide (SO_2) and other pollutants emitted by burning coal.

Environmental Protection is central to the PSD program and it is to this end that the Spokane Tribe must insist on eliminating the potential for further degradation of Air Quality within this region.

As custodians of their land the Spokane Tribal Council is charged with preserving their life ways for future generations.

For the purposes of this section we will be concerned specifically with those areas located approximately within a radius of thirty miles. This focus will allow us to predicate our discussion on area similar in physical and socio-economic structures and functions.

8.2 Impact on Environmental Health

It must be understood that Class I redesignation will by its very definition not improve existing air quality nor will it require any measures to make our air cleaner than it already is. The PSD regulations do not have provisions which would affect pollution sources already in operation at the time redesignation is granted. Instead, Class I only protects us and our neighbors from future air quality degradation. A Class I designation will prevent significant deterioration of our present air quality. Specifically Class I will limit the allowable increases in SO- and particulate matter pollution.

8.3 Health Impacts

The following section is in large part extracted from the Ft. Pecks Class I redesignation document.

HEALTH

Redesignation to Class I will have long-term beneficial impacts on the health of reservation residents, and the surrounding populous, by minimizing the probability of health problems associated with sulfur dioxide and particulate matter. Although t present very little data exists on the health effects of low levels of these pollutants, higher concentrations have clearly been implicated as causing adverse impacts to human health.

When sulfur dioxide is inhaled through the nose or mouth, it is rapidly absorbed into the blood stream and distributed throughout the body. Sulfur dioxide in the blood has been observed to react with proteins, inactivate certain enzymes and even interfere with cellular genetic material (DNA), although the significance of these effects is not clear. However, once the sulfur dioxide reaches the lungs, either from direct inhalation or by transportation through the blood, adverse impacts may result.

Numerous studies have confirmed that the lungs are highly sensitive to sulfur compounds, and a relationship has been established between irritation of the throat and lungs by sulfur oxides and increased respiratory problems. Acute levels of sulfur dioxide can act on the small airways of the deep lung to significantly impair lung function, and may also reduce the rate of nasal mucous flow, which is thought to be an important part of the body's defense against infection.

Children and persons with existing respiratory conditions are considered to be particularly vulnerable to sulfur dioxide. Increased incidence of bronchitis and chest colds among school children have been noted in more heavily SO- polluted areas, while a hospital admissions study in Los Angeles identified sulfur dioxide levels as the most consistent influence on lengthened periods of care, particularly for patients with heart and lung diseases. Several epidemiological studies have concluded that there is no threshold for sulfur dioxide damage among the most sensitive portion of the population. A study on asthma patients living near a coal-fired power plant found health responses at all pollutant concentrations measured, with attack rates increasing uniformly from the lowest levels of pollution to the highest. In an extensive literature review recently conducted by the Montana State Air Quality Bureau, their findings on the health effects of sulfur dioxide conclude that:

> The primary effects on human health associated with exposure to sulfur dioxide (a decrease in lung function, an increased incidence of respiratory disease among children, a decline in the health of individuals with chronic obstructive lung conditions to and including death, and an increase in the number of asthma attacks among persons with asthma) present a risk to the health of a vulnerable population group in the community and may result in permanent damage.

Sulfur oxides can also combine with other air contaminants, especially particulates, to form a pollutant complex more hazardous to human health than the sum of their individual effects. Some particulate surfaces are substantially more irritating than an equivalent concentration of sulfur dioxide. In addition, fine particulates can carry sulfur dioxide deep into the human lung, increasing the potential for more serious damage.

Particulates themselves may also have adverse impacts on human health, with the nature of the damage dependent upon particle size and composition. Coarse particles generally settle out of the air close to their source, while fine particles tend to move with the air and remain suspended for much longer periods. This contrast in behavior also causes the two types of particles to act differently when inhaled; the large particles usually collect on the surfaces of the nose and throat and are thus more likely to flow around the obstructions in the airways and reach the lungs. Very fine particles may remain in the lungs for long periods. If the particle is toxic, or is carrying other toxic materials such as heavy metals or organic substances, these contaminants may be obsorbed into the bloodstream and thus be transported to other parts of the body.

Fine particulates have been related to respiratory illness, cardiovascular disease, neurological damage and cancer. In addition, increased mortality has been shown to accompany higher levels of particulate matter.

In summary, the evidence shows a very real cause and effect relationship between sulfur dioxide and particulate pollution and injury to human health. It is difficult to estimate from the available data exactly what impacts could be expected under the allowable Class II increments. However, the vulnerability of sensitive groups in the population -- such as children, the elderly, and those with existing respiratory conditions -- are of particular concern to the Tribes. The added margin of safety by Class I is necessary to protect human health and would be of long term benefit to all people on the reservation and in the surrounding areas.

8.4 <u>Impacts on Agricultural Activities</u>

Redesignation will greatly enhance the maintenance of agricultural activities within the affected region. Specific impacts of SO- were detailed in section 6.2.2. Due to the paucity of data it is still left unclear what the long term impacts of SO- and TSP on agricultural crops.

Redesignation will assist in preventing major pollution sources from locating within this region thus protecting crops sensitive to SO_2 .

Research has shown agricultural crops noted in this area are sensitive to SO_2. From this we can infer that any significant increases in SO_2 would have a serious impact on crop production in this area.

Class I will not affect agricultural and timber industry waste disposal methods now instituted within this region but it may have an impact on increased disposal activities which degrade air quality. Such activities may be coordinated with the State of Washington.

8.5 Impact on Energy Activities

Redesignation will insure that all new sources of energy produced through the use of fossil fuels may be limited or prohibited. We find this in keeping with the Reagan's just released policy statement limiting pollution sources of Acid rain.

Coal fired generating facilities planned for this region would increase the levels of SO_2 and particulates transmitted thus redesignation by the Spokane Tribe may either eliminate the custom site as proposed or cause the planned facility to consider design changes bringing them under Class I guidelines.

The Northwest Power Planning Council recently adopted its new 1986 Northwest Power Plan. Within this plan the council attempts to delineate and prioritize those energy resources needed over a twenty year span of time. Different growth scenarios were used within the resource priority scheme. A portfolio of new electrical resources to meet the projected needs was established. "To be included in the portfolio, a resource must be available, reliable and acceptable"*. The energy resources were listed by placing the most cost effective first. After each was identified, estimated highest power demand forecast needs were shown.

1. Conservation: 3,900 megawatts
2. Better use of existing hydropower system: 700 megawatts
3. New hydropower: 200 megawatts
4. Cogeneration: 320 megawatts
5. Coal: 5,425 megawatts (12 plants)

"This is the last and most expensive resource to come on line and would be used only if high growth made it necessary. (using all 12 plants would require unprecedented high growth) In its plan the Council called for intensified research and testing of renewable energy resources so that they can be ready and cost effective before the region needs to turn to some or all of the coal plants."*

The Council further states that as renewable resources such as geothermal, wind and solar prove to be cost effective and reliable they could replace some coal generation in the future thus some of the environmental problems and expenses - of coal plants might be avoided.

The Spokane Tribe is encouraged by the advent of new technologies enabling the northwest to meet its future energy demands.

Improved design of nuclear facilities - more efficient uses of hydropower - waste energy - increased use of renewable resources - conservation; all have the potential of greatly reducing the

* Extracted from, Northwest Energy News: Vol 5, no. 2, February/March 1986

demand for fossil fuels as a primary source for energy production.

8.6 Tourism

Redesignation would enhance this regions ability to attract visitors and tourist related development.

The Grand Coulee National Recreation area boarding the Spokane reservation is renowned for its beauty and the availability of a wide variety of recreational uses. Through federal and private sector efforts new facilities are planned enhancing further the economy of this area.

If we are to increase the economic value of tourism it is imperative that air quality be maintained as pristine as possible. Deterioration of air quality will adversely impact an economy now more dependent on the tourist industry.

8.7 Socio - Economic Impacts

Class I air is consistent with the existing agricultural society and economy of the Spokane reservation and adjacent communities. Agriculture, timber and tourism predominate as economic activities.

Redesignation will assist in the maintenance of a social structure based on this spectrum of human endeavor. This is true not because redesignation will prevent all polluting industries from locating in this region, for it will not. Rather it will serve to limit the number of large scale industries capable of degrading our air through the emission of pollutants. This would in turn lessen the probability of large scale population infusions. Populations would tend to be stable with infrastructure needs evolving to meet planned growth patterns. Social and political breakdowns due to fast paced population increases would be minimized.

It is difficult to project growth based on speculation therefore we are unable to anticipate the full extent of the impact of Class I air on a projection but we can say Class I air will not hurt the existing economy. Development beneficial to our communities can and will take place. The important lifeways and values of our communities be sustained and enhanced by those actions protecting our environment.

We anticipate redesignation will garner wide support from our neighbors when each community realizes that it is not the intent of the Spokane Tribe to restrict development within our region, but it is to insure the maintenance of an environment supportive of a healthful productive human experience.

8.0 CONCLUSION

It is the intent of the Spokane Tribe to proceed with the redesignation of air quality within the boundaries of the Spokane Reservation. Such an action will protect and preserve the air quality environment on tribal lands. Although the air quality resources of the Spokane Tribe are assumed to be excellent, an ambient air quality and meteorological monitoring program should be initiated on the reservation. The Spokane Tribe has requested that this action be taken concurrent with the remaining requirements for redesignation.

It is understood by the tribe that action to redesignate tribal lands to the more pristine Class I status may place limits on development activities on the reservation which would produce TSP or SO_2 emissions but it is also felt the maintenance of exceptional air quality standards will have positive long lasting impacts on all aspects of life on the Spokane Reservation.

REFERENCES

Albert, M. 1984. Personal Communication.
Washington State Department of Game, Spokane, Washington.

Burt, Edward, W. 1977. Valley Model User's Guide.
EPA-450/2-77-018. Research Triangle Park, NC:
United States Environmental Protection Agency.

CERT, 1983; Environmental Assessment of Uranium Development on the Hualapai Reservation, Council of Energy Resource Tribes, February, 1983.

CERT, 1984; Spokane Air Quality Analysis, Council of Energy Resource Tribes, June, 1984.

CERT, 1985; Supplemental Air Quality Analysis, Spokane Reservation, Council Energy Resource Tribes, April, 1985.

Clean Air Act (42 U.S.C. 1857 et seq.); The Clean Air Act as Amended, August 1977.

Cooper, John A., 1980; "Environmental Impact of Residential Wood Combustion Emissions and its implications," APCA Journal, Vol. 30, No. 8, August, 1980.

Dames and Moore. 1974 Environmental Assessment, Proposed Sherwood Uranium project Stevens County, Washington for Western Nuclear, Inc.

Daubenmire, R. and J. B. Daubenmire, 1968; Forest Vegetation of Eastern Washington and Northern Idaho. Washington Agricultural Experimental Station, Technical Bulletin 60.

Department of Ecology, 1983; Revision to the Washington State Implementation Plan, Washington State's Visibility Protection Program, Air Programs, Washington DOE. February, 1983.

Evans, L. S. and P. R. Miller, Historical Comparison of single additive O_3 and SO_2 Injuries to Elongating Ponderosa Pine needles. Am. J. Bot. 62: 416-421, 1975.

Franklin, J. F. and C. T. Dryness. 1973; Natural Vegetation of Oregon and Washington. Pacific Northwest Forest and Range, Forest Service, USDA, General Technical Report PNW-8.

Johns, R. 1984; Personal Communication. Washington State Department of Game, Ford, Washington.

Larrison, E. J. 1981; Birds of the Pacific Northwest, Washington, Oregon, Idaho and British Columbia. Moscow, ID: University Press of Idaho.

Lane, A. Glen. 1981; Fort Peck Air Quality and Visibility Analysis. CERT/TR-80-181-02. Englewood, CO: Council of Energy Resource Tribes.

McMahon, C. K., 1983; "Characteristics of Forest Furls and Emissions," USDA Forest Service, presented at APCA annual meeting, June 1983.

Nussbaum, R. A., E. D. Brodie, R. M. Storm. 1983; Amphibians and Reptiles of the Pacific Northwest. Moscow: University Press of Idaho.

Polker, R. J. and H. D. Hartwell. 1973; black Bear of Washington. Washington State Department of Game, Biological Bulletin No. 14.

Robbins, C. S., B. Bruun and H. S. Zim. 1966; Birds of North America. New York: Golden Press.

Spokane Tribe. 1984; Unpublished Data.

Spokane Tribe, 1984; Special Census Report.

Spokane Tribe. 1985. Various conversations between Tribal officials and CERT, January-March, 1985.

Spokane Tribe. 1982; Socio-Economic Report Spokane Indian Tribe 1980-81.

TERA Corporation and Washington Water and Power Corporation. 1981/1982. Creston Generating Station PSD Application DL-81-008-3 submitted to the U. S. EPA by the Washington Water and Power Company on March 31, 1981 (revised January 1982.)

Tingey, D. T., and R. A. Reinert. Effect of Ozone and Sulfur Dioxide singly and in combination on Plant Growth. Environment Pollution. 9: 117-125, 1975.

Turner, D. B., 1964; "A Diffusion Model for an Urban Area," Journal or Applied Meteorology, Volume 3, 1964.

United States Bureau of Census. 1980; Census of Population Characteristics 1980. U. S. Department of Commerce.

United States Bureau of Census. 1981; County Business Patterns Washington 1981. U. S. Department of Commerce.

United States Bureau of Indian Affairs. 1982; Unpublished Data.

United States Bureau of Reclamation. 1975. Negative Determination of environmental Impact Spokane Indian Reservation, Washington; Irrigation Development of the Little Falls Flat and Bull Pasture areas. Boise, ID. U. S. Department of Interior, NDN 75-3.

U.S.D.A., Soil Conservation Service. 1981. Soils Survey Stevens County, Washington.

U.S.D.A., 1981; Land Resource Regions and major Land Resource Areas of the United States: Agricultural Handbook No. 296, USDA Soil Conservation Service, 1981.

U.S.D.I., Bureau of Indian Affairs. 1976; Sherwood Uranium Project, Spokane Indian Reservation. Portland, Oregon.

U.S.D.I., Bureau of Indian affairs 1983; Wildlife Observation on Spokane Reservation. Spokane Agency.

U.S.D.I., Bureau of Land Management. n.d. "Management Situation Analysis, Huckleberry Mt. management area, wildlife." management report Spokane, Washington.

U. S. - E.P.A., Monitoring and Data Analysis Division. 1977; Users Manual for Single-Source (CRSTER) model. EPA-450/2-77-013. Research Triangle Park, N.C.: U. S.-EPA.

U. S. - E.P.A., 1981; OAQPS Guideline Series: Guideline on Air Quality Models. Washington, D.C. EPA.

Ward, D. E., 1983. "Source-strength modeling of Particulate Matter Emissions from Forest Fires," USDA Forest Service, presented ACCA Annual meeting June, 1983.

Washington Department of Game, n.d. Washington's Threatened and Endangered Wildlife.

Washington Department of Game. 1983. Washington State Special Animal Species. Woodward, W. L. 1973. Water Resources Spokane Indian Reservation: Spokane Tribe of Indians Reservation.

Wilhour, R. G. A. Neely, D. Weber and L. Grothaus. The response of selected small grains and range grasses, and alfalfa to SO_2. In: Bioenvironmental Impact of a Coalfired Power Plant: An Interim Report. E^2. M. Preston and T. L. Gallett, eds., EPA

600/3-79-044, U.S.-EPA, Corvallis Environmental Res. Lab., Corvallis, OR. December 1978, pp. 592-609.

Zender, Steve. 1984; Personal U.S.D.I. BLM, Chewelah, Washington.

To: Wilson, Wenona[Wilson.Wenona@epa.gov]
Cc: Bray, Dave[Bray.Dave@epa.gov]
From: Ken Merrill
Sent: Wed 9/28/2016 9:43:32 PM
Subject: RE: Preliminary screening model for air impacts from Smelter near Kalispel Reservation
HiTest Sand Inc Project Overview - USK, WA.pdf

FYI- Attached is some info on the smelter project sent to us by the project proponent. PM numbers are omitted for some reason --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)
Kalispel
natural resources

From: Ken Merrill
Sent: Tuesday, September 27, 2016 4:46 PM
To: Wilson, Wenona
Cc: 'Bray, Dave'; Zach Welcker; Deane Osterman
Subject: Preliminary screening model for air impacts from Smelter near Kalispel Reservation

Hi Wenona,

Thank you for your time today, and as we discussed, the Tribe needs to understand how the proposed smelter might impact the home of the Kalispel people and understand how a redesignation of the Tribes airshed to Class 1 might affect the PSD permitting outcome and the Tribe's air quality. If there were a way that EPA could help to do some screening modeling, we think it would help the Kalispel develop the capacity to best protect our right to clean air on the reservation.

Thanks for the consideration --Ken

Kenneth R. Merrill
Manager - Water Resources Program
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PO Box 39, Usk, WA, 99180
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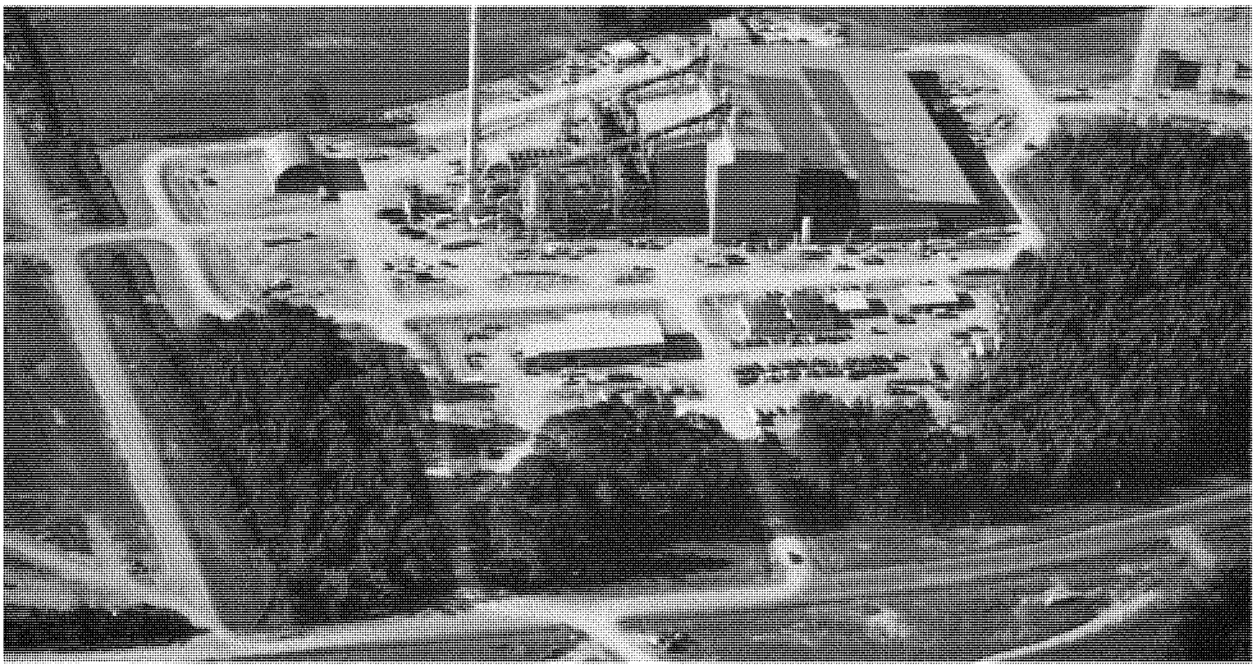
natural resources

HiTest Sand
Responsibly supplying Hi-quality silica

HiTest Sand Inc. Silicon Project Overview

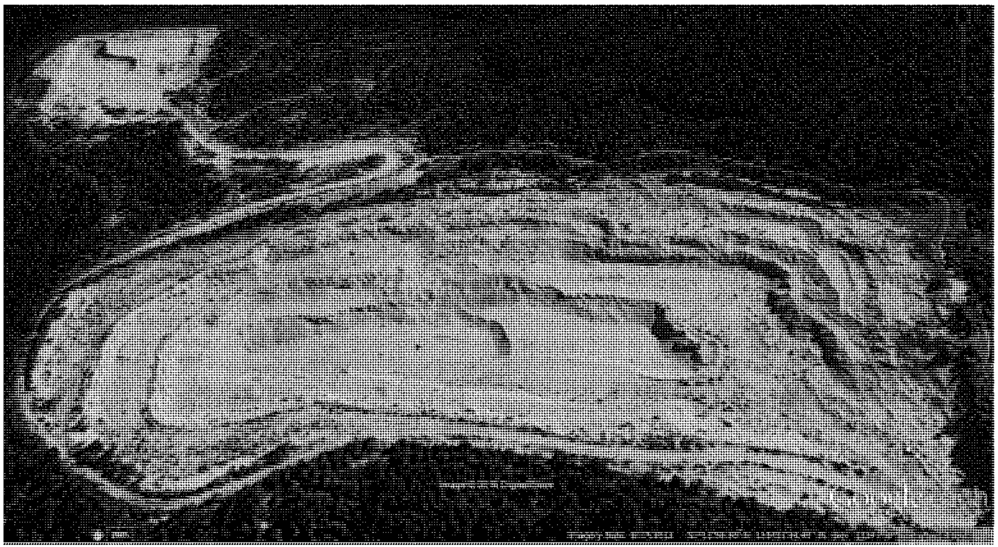
September, 2016



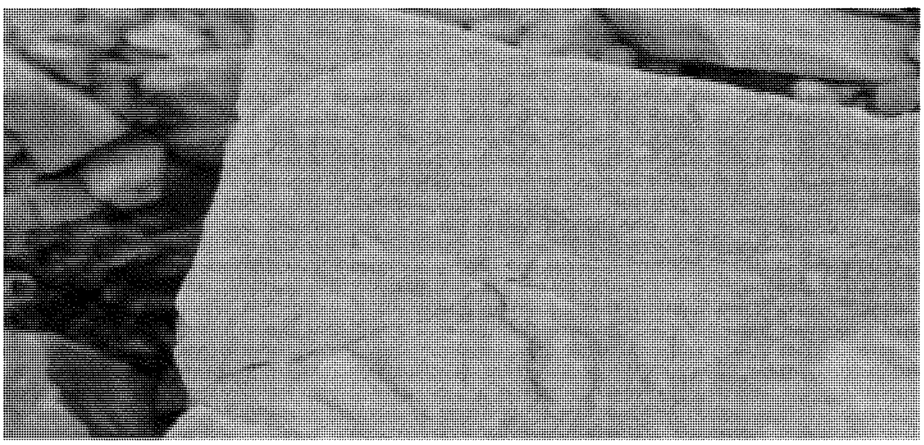
Overview of recently built silicon plant

I. Introduction

HiTest Sand is an integrated silica quartz mining and silicon metals processing company based in Edmonton, Alberta. HiTest is the 100% owner of a high quality, large silica quartz mine deposit located near Golden, British Columbia. The existing open pit quarry is currently fully permitted for 800,000 tonnes/year and was in operation from 1980-1999 with peak production rates of 110,000 tonnes/year shipped to Dow Corning for use in its Silicon Metal smelters in Washington and Oregon, USA.



In 2013, the lease deposits were assessed by third-party analysis to possess 51,000,000 tonnes of proven reserves with an additional 28,000,000 tonnes of probable reserves. In addition to over 300 historical tests showing the mine's Silica Ore samples contained 99.85% SiO_2 purity (Bondar-Clegg Certificate of Analysis), recent analysis in 2014 by Sintef Labs (Norway) on purity and thermal stability showed quartz samples have excellent resistance towards thermal shock heating and greater than 99.82% SiO_2 purity. These chemical and purity attributes (low Boron, low Phosphorous) make the HiTest silica quartz and processed silicon optimal for the premium processed silicon metals market, including polysilicon products, solar panels, LCD screens and aluminum alloys.



The combination of large proven reserves, high SiO_2 purity, and low regulated power prices provide a competitive environment for the construction and operation of an integrated silica quartz mining and silicon metals processing plant facility. The project's strategic advantages are our ability to pull high quality silica raw materials from a single large mining operation into a co-located processing facility with low power rates, and to produce high grade silicon metals at competitive operating costs.

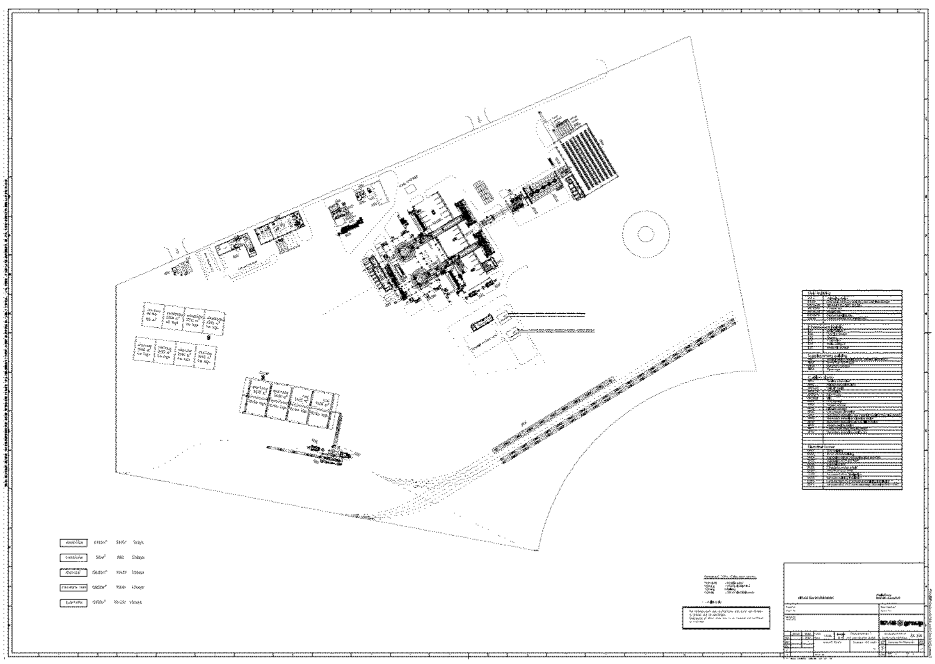
The submerged arc plant design will use two furnaces to produce 55,000 tonnes of tapped Silicon per year. Once commissioned in early 2019, the first HiTest plant will achieve 55,645 tonnes production.

Due to the high quantity of silica quartz supply available, the project is considering the development of two successive process plant projects, one co-located with the mine in Golden, BC and the other in Washington State, both with significant government support.

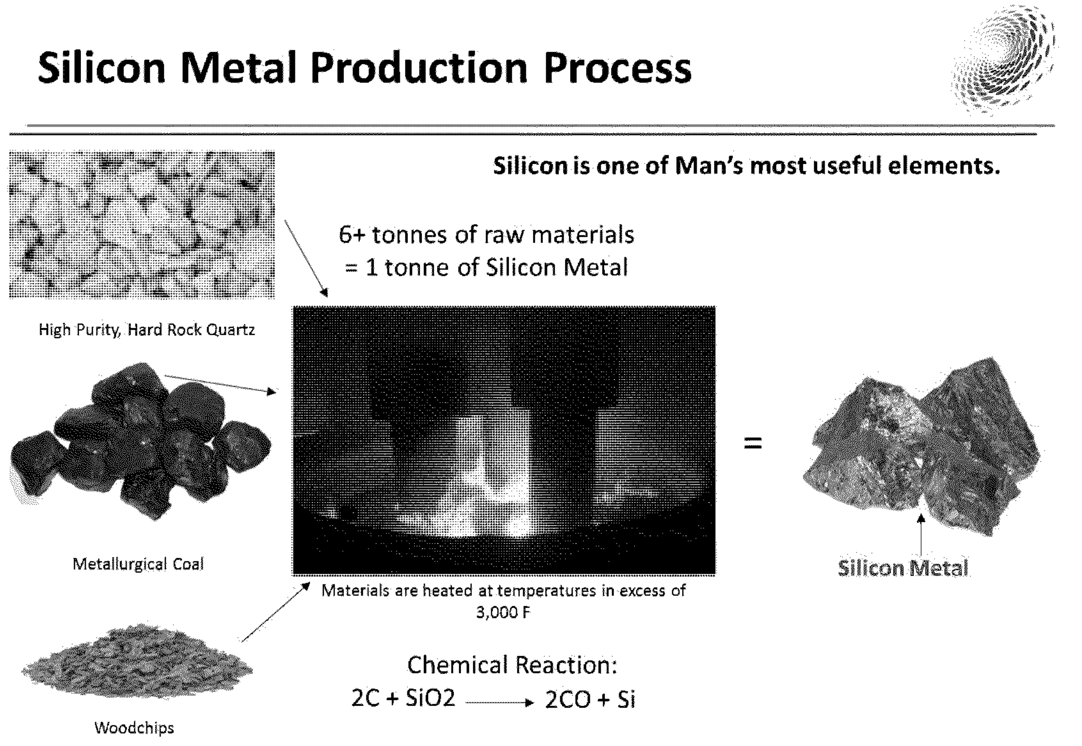
The project requires an estimated capital budget of USD $300M to design, engineer, procure, construct and commission the first plant over a 22-month period with site construction targeted to start by Q2 2017. To date HiTest has spent approximately $20Million of its own capital. Additionaly, HiTest has secured debt finance options for up to USD $200M and is finalizing terms with strategic equity investment partners for up to an additional $150M in equity by Q4 2016 for the detailed project.

2. USK, WA Site

One of the potential sites is in USK, WA utilizing approx. 80 acres of un-developed land on the PNC property. A preliminary site layout is shown:



3. Process Description



Silicon Metal is produced at a temperature of about 2,000C in submerged-arc electric furnaces. The process requires about 13,000 kwh/MT of silicon metal produced. The main raw materials are high purity quartz rock, low ash metallurgical coal, wood chips and carbon electrodes. No hazardous waste or chemicals are involved in the process.

The plant will consume approximately:

143,000 tonnes of high quality quartz (brought by rail)

143,000 tonnes of local wood chips (brought by truck)

66,000 tonnes of low ash metallurgical coal (brought by rail)

4. Environmental Parameters

Typical Off-Gas Analysis and Data:

N_2 = 76 Vol%

O_2 = 18 Vol%

CO_2 = 4 Vol%

H_2O = 2 Vol%

Temperature = approx.. 200C

Off-gas Generation = approx. 70,000 nm3 per MT of silicon

<u>Estimated Emissons of controlled gases</u>

COX = 150,000 – 200,000 MT/year depending on furnace operating conditions

SOX = 1,500 – 2,000 MT/year depending on raw material selections

NOX = 1,000 – 2,000 MT/year depending on furnace operating conditions

Opacity = 5 – 15 % depending on operating conditions

<u>Water Usage and Parameters</u>

1. Closed loop system utilizing makeup water only = 200 – 300 gal/day.

2. Sanitary water for approx.. 170 employees

3. Storm water collection system

<u>Solid Waste Parameters</u>

1. Furnace Dust – approx.. 20,000 MT/year collected and sold – no waste

2. Refining slag and dross – approx. 4,000 MT/year collected and sold – no waste

3. Small amounts of misc. bag house dust collected and recycled – minimal waste

4. No hazardous wastes or heavy metals

For additional questions please contact:

Jim May – Chief Operating Officer HiTest Sand

jmay@hitestsand.com

To: Wilson, Wenona[Wilson.Wenona@epa.gov]
Cc: Bray, Dave[Bray.Dave@epa.gov]; Zach Welcker[ZWelcker@kalispeltribe.com]; Deane Osterman[dosterman@kalispeltribe.com]
From: Ken Merrill
Sent: Tue 9/27/2016 11:46:02 PM
Subject: Preliminary screening model for air impacts from Smelter near Kalispel Reservation

Hi Wenona,

Thank you for your time today, and as we discussed, the Tribe needs to understand how the proposed smelter might impact the home of the Kalispel people and understand how a redesignation of the Tribes airshed to Class 1 might affect the PSD permitting outcome and the Tribe's air quality. If there were a way that EPA could help to do some screening modeling, we think it would help the Kalispel develop the capacity to best protect our right to clean air on the reservation.

Thanks for the consideration --Ken

Kenneth R. Merrill
Manager - Water Resources Program
Kalispel Tribe Natural Resources
PO Box 39, Usk, WA, 99180
(509) 447-7276 (office)
Ex. 6 (cell)

To: Bray, Dave[Bray.Dave@epa.gov]
Cc: Deane Osterman[dosterman@kalispeltribe.com]; Zach Welcker[ZWelcker@kalispeltribe.com]
From: Ken Merrill
Sent: Tue 9/27/2016 3:02:09 PM
Subject: RE: Kalispel questions on airshed redesignation
removed.txt

Hi Dave,
How about 9:30? We will call you at your office.
Thanks --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, September 26, 2016 3:33 PM
To: Ken Merrill
Subject: RE: Kalispel questions on airshed redesignation

Hi Ken,

Thursday this week looks pretty good right now. I'm available anytime except from 11:00 am to noon.

If that doesn't work, we can look to see what works for us next week.

Dave

David C. Bray
Associate Director for Air
Office of Air and Waste
EPA Region 10
Seattle, WA
(206) 553-4253

From: Ken Merrill [mailto:kmerrill@knrd.org]
Sent: Monday, September 26, 2016 3:27 PM
To: Bray, Dave <Bray.Dave@epa.gov>
Subject: Kalispel questions on airshed redesignation

Hi Dave,
We were hoping to arrange another call with you soon to discuss some more questions. What time and day might work?
Thanks --Ken

Kenneth R. Merrill
Manager - Water Resources Program
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PO Box 39, Usk, WA, 99180
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Kalispel
natural resources

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************************** ATTACHMENT REMOVED **************************

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To: Bray, Dave[Bray.Dave@epa.gov]
From: Ken Merrill
Sent: Mon 9/26/2016 11:33:54 PM
Subject: RE: Kalispel questions on airshed redesignation
removed.txt

OK. I'm trying to find out from my guys also. --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, September 26, 2016 4:32 PM
To: Ken Merrill
Subject: RE: Kalispel questions on airshed redesignation

I could do a call between 9 and noon tomorrow.

Dave

From: Ken Merrill [mailto:kmerrill@knrd.org]
Sent: Monday, September 26, 2016 4:30 PM
To: Bray, Dave <Bray.Dave@epa.gov>
Subject: RE: Kalispel questions on airshed redesignation

My bad. Let me get back to you, but sometime tomorrow would be best for us --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, September 26, 2016 4:25 PM
To: Ken Merrill
Subject: RE: Kalispel questions on airshed redesignation

Hi Ken,

Sorry for the confusion – 11 am is the one time that I'm NOT available on Thursday.

Does another time work for you all?

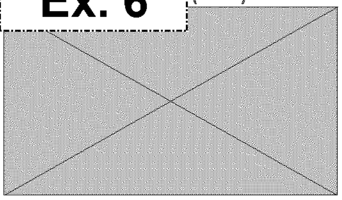
Dave

From: Ken Merrill [mailto:kmerrill@knrd.org]

Sent: Monday, September 26, 2016 4:23 PM
To: Bray, Dave <Bray.Dave@epa.gov>
Subject: RE: Kalispel questions on airshed redesignation

Hi Dave,
Please mark us down for 11 on Thursday.
Thanks --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)



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Kalispel
natural resources

************************* ATTACHMENT REMOVED *************************

This message contained an attachment which the administrator has caused to be removed.

************************* ATTACHMENT REMOVED *************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

To: Bray, Dave[Bray.Dave@epa.gov]; Ken Merrill[kmerrill@kalispeltribe.com]
From: Zach Welcker
Sent: Mon 2/26/2018 10:22:19 PM
Subject: RE: Kalispel Class I Designation

Thanks for the update.

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, February 26, 2018 1:52 PM
To: Zach Welcker; Ken Merrill
Subject: RE: Kalispel Class I Designation

Hi Zach,

We were hoping to have our proposed approval published by now as well.

We're still waiting for the "green light" from the OAR Assistant Administrator Bill Wehrum.

Under our delegation from the Administrator, we need to consult with the OAR Assistant Administrator before we propose a revision to a federal implementation plan for any Reservation (which is how we codify the PSD reclassification per the Arizona court decision). We completed that consultation a few weeks ago but it ended with Bill telling Chris Hladick, our new Regional Administrator, to hold off proceeding with the rulemaking until he got back him.

So we're just treading water waiting to hear back from the AA. I ask every week whether we've heard anything but I don't think that our RA wants to ask Bill if he's ready to let us publish our proposal. It may take someone other than me and my manager to rattle the cage and get this moving.

Dave

David C. Bray
Associate Director for Air
Office of Air and Waste
EPA Region 10
Seattle, WA
(206) 553-4253

From: Zach Welcker [mailto:ZWelcker@kalispeltribe.com]
Sent: Monday, February 26, 2018 1:32 PM
To: Bray, Dave <Bray.Dave@epa.gov>; Ken Merrill <kmerrill@kalispeltribe.com>
Subject: RE: Kalispel Class I Designation

Hi Dave,

What's the status of our Class I request? We were under the impression that EPA's decision would be in the FR by now. Please advise.

Thanks,
Zach

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Thursday, February 08, 2018 10:18 AM
To: Ken Merrill
Cc: Zach Welcker
Subject: RE: Kalispel Class I Designation

Hi Ken,

I'm concerned and somewhat surprised as well but for a different reason. Your request doesn't go to EPA headquarters because

Region 10 has been delegated authority to approve these. Region 10 is the only Region that has such a delegation (because of the FARR) and the HQ Tribal folks should know that. We've followed the procedures in that delegation and our new Regional Administrator met with the new Assistant Administrator for Air (Bill Wehrum) last week to fulfill our obligation to consult with the AA.

The Federal Register proposing approval is ready to go and we're working on getting a space in Newport for our public hearing. At this time, we're just waiting for the green light from Bill Wehrum to move forward with the proposal.

I will touch base with the HQ tribal folks to make sure they understand where we are in the process. I wonder who the "EPA representative" was.

Dave

David C. Bray
Associate Director for Air
Office of Air and Waste
EPA Region 10
Seattle, WA
(206) 553-4253

From: Ken Merrill [mailto:kmerrill@kalispeltribe.com]
Sent: Thursday, February 08, 2018 9:53 AM
To: Bray, Dave <Bray.Dave@epa.gov>
Cc: Zach Welcker <ZWelcker@kalispeltribe.com>
Subject: Kalispel Class I Designation

Hi David,
According to Kevin Greenleaf at the Kootenai Tribe, during an NTAA Listening Session for EPA TAC's and Headquarters Indian Coordinators an EPA representative told the group that they have not had the formal request from the Tribe to R-10 sent to them yet.

I was somewhat concerned but not surprised when I heard that, and I was wondering if there any problems with the progress toward our redesignation approval.
Thanks --Ken

Kenneth R. Merrill
Manager - Water Resources ProgramH
Kalispel Tribe Natural Resources
PO Box 39, Usk, WA, 99180
(509) 447-7276 (office)
Ex. 6 (cell)

To: Bray, Dave[Bray.Dave@epa.gov]
From: Ken Merrill
Sent: Mon 9/26/2016 11:30:20 PM
Subject: RE: Kalispel questions on airshed redesignation
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My bad. Let me get back to you, but sometime tomorrow would be best for us --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, September 26, 2016 4:25 PM
To: Ken Merrill
Subject: RE: Kalispel questions on airshed redesignation

Hi Ken,

Sorry for the confusion – 11 am is the one time that I'm NOT available on Thursday.

Does another time work for you all?

Dave

From: Ken Merrill [mailto:kmerrill@knrd.org]
Sent: Monday, September 26, 2016 4:23 PM
To: Bray, Dave <Bray.Dave@epa.gov>
Subject: RE: Kalispel questions on airshed redesignation

Hi Dave,
Please mark us down for 11 on Thursday.
Thanks --Ken

Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)

From: Bray, Dave [mailto:Bray.Dave@epa.gov]
Sent: Monday, September 26, 2016 3:33 PM
To: Ken Merrill
Subject: RE: Kalispel questions on airshed redesignation

Hi Ken,

Thursday this week looks pretty good right now. I'm available anytime except from 11:00 am to noon.

If that doesn't work, we can look to see what works for us next week.

Dave

David C. Bray
Associate Director for Air
Office of Air and Waste
EPA Region 10
Seattle, WA
(206) 553-4253

From: Ken Merrill [mailto:kmerrill@knrd.org]
Sent: Monday, September 26, 2016 3:27 PM
To: Bray, Dave <Bray.Dave@epa.gov>
Subject: Kalispel questions on airshed redesignation

Hi Dave,
We were hoping to arrange another call with you soon to discuss some more questions. What time and day might work?
Thanks --Ken

Kenneth R. Merrill
Manager - Water Resources Program
Kalispel Tribe Natural Resources
PO Box 39, Usk, WA, 99180
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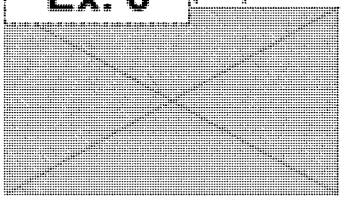
Ken Merrill
Water Resources Program
(509) 447-7276 (office)
Ex. 6 (cell)



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